

S I N C L A I R

Every month £1.25 February 1988

DENMARK DKR 40.00

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QL WORLD

ELECTRIC SECRETS

Inside the QL —
microdrives, regulators
and interfaces

**Microbridge —
The QL shows
its hand**

**Imagine a
new
adventure**

**Super Basic:
linear lists**

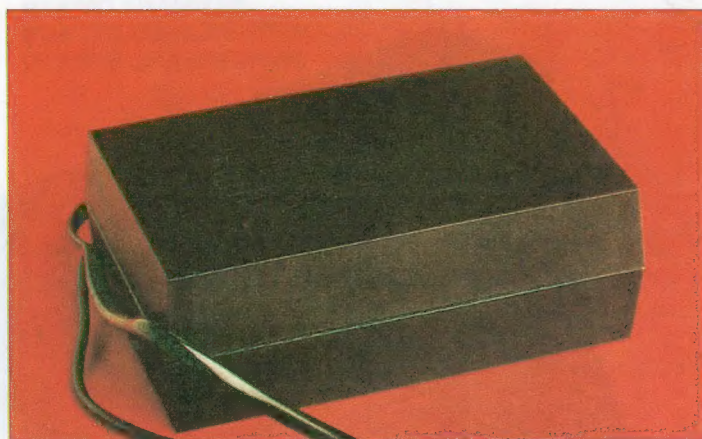
**DIY Toolkit:
file headers**



Introducing

QTALK

TEXT TO SPEECH IN A FLASH



| | |
|----------------|---------------|
| PRICE | |
| Qtalk | £75.00 |
| VAT | £11.25 |
| Post/Packaging | £ 2.25 |
| Total | £88.50 |

Qtalk Applications

- 1) **Health**
 - a viable solution to speech impairment/impediment
 - allows the blind to write documents and programs
- 2) **Education**
 - an excellent tool for teaching the relationship between the written and the spoken word
 - a valuable aid to those assisting the dyslexic or for students with reading problems
 - an amazing new method for teaching or learning the translation of one language to another
 - touch typing made easy with keyboard echo
- 3) **Industry**
 - enables verbal output of readings/warnings from independent peripherals. (BUS, IEEE, RS232 etc)
 - can be used to give instructions to an operator
 - could be set up as an answerphone or entryphone
- 4) **Entertainment**
 - allows the user to verbally list programs while checking them against a hardcopy listing
 - can be made to hum musical tunes
 - provides a whole new dimension to computer games

Hardware Features

- RS232C, Selectable baud rate, DCE or DTE**
- will operate on any computer with an RS232 port
 - at any standard baud rate
 - does not tie up the expansion port

Three adjustable presets:

- allows adjustment of Volume, Pitch and Pitch range (16 levels)

Black Eurocard enclosure, QL plug, power lead, socket and serial cable

- simply plugs in between your power supply and QL
- maintains the integrity of your computer system

(Note. CST Thor version is powered through the serial lead)

Software Features

Full 68000 Text To Speech software incorporating 16 levels of pitch.

- lightning fast conversion of any string into speech
- any multi syllable word may be split, with different syllables spoken at differing levels of pitch, allowing intonation
- 20K of code. Will work on standard (128K) machine and Thor

Built in Exception Table (BET)

- certain words defy all logic and no amount of rules can cater for these. Therefore, their pronunciation has been permanently set in an exception table. eg 'thorough', 'ghoti', 'Lbytes', 'flp1'

Size selectable User Exception Table (UET)

- Users can set up their own table of any size and fill it with their own words/pronunciations. This overrides words in the built in table therefore allowing translation of languages. This table can be saved and reloaded for later use.

Over 400 rules to convert text to speech.

- If the word or string is not found in either table it will be pronounced via a sophisticated set of rules.

Full Device driver implementation.

- a new device called 'QTK' is added to the QL's list of devices. This means that you can use all of the built in basic keywords to send information to QTALK. eg PRINT, LIST, DIR, COPY etc. and also use QTALK with other computer languages (PASCAL, FORTRAN etc)
- a set of clever superbasic extensions is also included to make QTALK a breeze to use
- may be set to pronounce or ignore punctuation

Multitasking screen editor

- can be called up any time to set up and add, alter or delete words from the User exception table. Comprehensive on screen help.
 - Hopefully the last word in QL clocks — talking time and date
- Many more thoroughly documented features

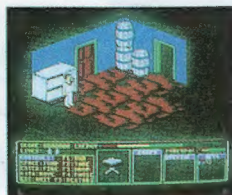
ALIEN HIJACK

The year is 2003 and you are working on the S.P.C. Forward, as ship's engineer. On the 23rd day you are attacked by an alien space ship and all hell breaks loose. You must regain control of your ship, against some mighty tough opposition.

The first TALKING game for the Sinclair QL. Possibly the most amazing QL graphics seen to date

- 3D graphics
- Full 68000 code
- 192 colour screens
- fast, dynamic, challenging
- talking hero and aliens

Note. Alien Hijack does not require QTALK to run but it certainly makes it a lot more fun. Works on a 128K QL.



| | |
|----------------|---------------|
| PRICE | |
| Alien Hijack | £15.00 |
| VAT | £ 2.25 |
| Post/Packaging | £ 1.00 |
| Total | £18.25 |

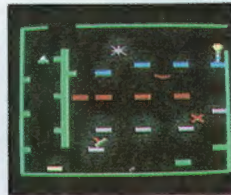
PUZZLE MANIA

Your mission, should you decide to accept, is to journey about the danger ridden cells of Maniaville to retrieve the lost loot of Lawless Lenny. Several obstacles will attempt to thwart your progress and only the smartest gamer will survive.

The second TALKING game for the Sinclair QL

- full 68000 code — 40 colour screens — fast, arcade action
- spoken clues to help you win (if you are good enough)
- Truly addictive challenge

Note. Puzzle Mania can operate without QTALK but is much more fun with it.



| | |
|----------------|---------------|
| PRICE | |
| Puzzle Mania | £10.00 |
| VAT | £ 1.50 |
| Post/Packaging | £ 1.00 |
| Total | £12.50 |

Special Introductory Offer

Buy QTALK, PUZZLE MANIA and ALIEN HIJACK and receive £5.00 discount pre VAT total

Name _____ SQLW 2

Address _____

Please rush me _____

for my QL/THOR (cross out one which does not apply)
with software on 3 1/2" disc/mdv (cross out one which does not apply)

I enclose a bank cheque for £ _____
or please debit my Access/Visa card (cross out one which does not apply)

Card number

Expiry date _____ Signature _____

I appreciate that no funds will be deposited until despatch of goods. Please allow up to 21 days for delivery (airmail).

Maxtronics R&D Ltd
(New Zealand)

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ISSN 026806X

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Back issues are available from the publisher price £2 U.K., £2.75 Europe. Overseas rates on request. Please telephone 089 283 4783 to check availability.

Published by Focus Magazines Ltd., London

Distributed by Quadrant Publishing Services, Sutton.

Subscription information from: TIL, PO Box 74, Paddock Wood, Tonbridge, Kent TN12 6DW.

£15 U.K. £30 Surface mail Europe and the rest of the world. Add £5 for air mail + £10 overseas.

Typesetting by LSG Graphics, Gainsborough. Tel. (0427) 5323.

Printing by LSG Print Division, Lincoln. Tel. (0522) 513030.

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QL WORLD — 1988

CONTENTS

■ ■ FEBRUARY 1988 ●

- 7** QL SCENE ● Digital Precision burgeons
- 10** OPEN CHANNEL ● Witherows rise in force
- 16** SOFTWARE FILE ● New generation adventure
- 20** SUPERBASIC ● Linear lists
- 29** A BRIDGE GOES FAR ● The Microbridge report
- 35** INSIDE THE QL ● Preventative medicine
- 44** DIY TOOLKIT ● Head-it edits — plus EDLINES\$
- 50** FOCUS SALES POINT ● QL shoppers' paradise
- 52** MICRODRIVE EXCHANGE ● Pruned to perfection



NEXT MONTH

THE EDITOR

Digital Precision's The Editor is appearing in a new incarnation — more wordprocessor-like than before. Ron Massey reassesses it.

THE PROGS

Back after a month's holiday — QL World's regular aerobics session for fingers.

OUT OF THE SHELL

Another victim of the Christmas post, Compware's Expert System Shell has landed and awaits inspection by Marcus Jeffrey.

TURBO V2.0

Turbo V2.0 is the very latest version of Digital Precision's acknowledged world-beating compiler. SuperBasic programs compiled with Turbo can run 100 times faster! Ever since its release just over a year ago Turbo has astounded the pundits and amazed its users not just by its speed, but by its incredible flexibility and, in combination with the Turbo Toolkit, its vast array of powerful commands.

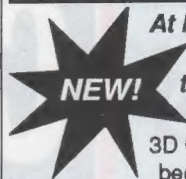
Turbo v2.0 has a totally reworked front-end user interface, allowing a huge number of compile options and - amazingly - a setting for how good a programmer you are! User configurable in advance and at runtime. Helpful error messages supplement the 350 page user encyclopaedia. Features smart auto-correction - Turbo is tolerant!

Turbo Toolkit now provides 200 additional commands, procedures and functions to increase the power of Superbasic, nearly all of which are available under the interpreter and Turbo. Turbo Toolkit is RAM-based and can be used as a stand alone utility or to complement existing toolkits such as Supertoolkit - it costs £29.95 by itself.

Turbo V2.0 system including Turbo Toolkit £99.95.

Upgrade Supercharge to Turbo for £65 - return mdv, manual and lenslok .

3D PRECISION



At last, a 3D modelling and CAD graphics package that truly does justice to the QL's potential.

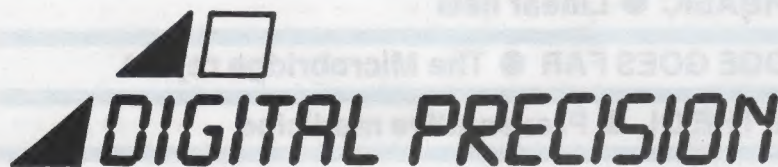
3D CAD on the QL has always been either too slow or too crude to be of any practical value - until 3D Precision. 3D Precision is a full featured, menu driven 3D designer and toolkit which enables you to easily produce professional looking 3D designs and drawings: there is no requirement for uniform cross sections and no restrictions on minimum step size.

3D PRECISION permits continuous, pre-programmed and co-ordinate based drawing with pan, scroll and rotate about any axis, all at astounding speed. Functions include recolour, rescale, recentre, zoom, edit, stretch and reposition. Perspective is continuously adjustable by zooming, translation and rotation of the 'camera'. Fully rubber banded autogeometrics are provided.

3D PRECISION comes with an easy to use toolkit which adds 100+ commands to SuperBasic and machine code. It's fast enough for animation, and gives you all the effects and controls you've dreamed of.

3D PRECISION provides advanced users with facilities for artistic/technical modelling, conceptualisation and manipulation in 3D.

3D Precision complete with toolkit and manual — only £49.95



222 The Avenue
Chingford
London
E4 9SE
Telephone 01-527 5493

THE EDITOR

"Superb...it exceeds feature specifications found even in the best word processors"

Sinclair QL World.

At last a word processor for the QL with truly professional facilities. The Editor is a word, text, character and file processing system of very superior capabilities. With 200 commands, very high speed and great flexibility, The

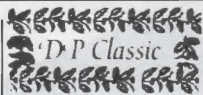
Existing users - upgrade to Special Edition Editor for only £25

Editor handles text files, Quill files, programs in SuperBasic and other languages, data files, screens, object files etc. Editor natively multitasks. A comprehensive configurator gives you total control over fonts, system defaults, colours, cursor speed, sizes...

The Editor V1.17, which works on any QL, comes with a comprehensive 90 page book.

EDITOR V1.17 £29.95
SPECIAL EDITOR £49.95

The Special Edition Editor V2.05 requires a minimum 128K extra RAM, has 40% more commands and a new 160 page manual. It's the last word.



EYE-Q

Eye-Q is the definitive graphics package for the QL.

Eye-Q is a program which will enable you to make the most of your artistic/design talents via an unequalled array of features and "drawing aids", an intelligent (and highly consistent) user interface with pop-up menus. In Eye-Q, the same keys do the same things

whichever option is selected: anything that can be done to the whole screen can be done to any part of it.

Eye-Q is 100% handwritten machine code: this gives it unsurpassed smoothness.

With fully comprehensive A4 manual.

£29.95

DESKTOP PUBLISHER

A full function DTP system for the QL with 256K RAM expansion.

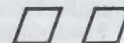
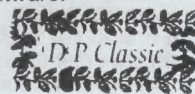
Acknowledged by the press to be equal to anything available on a home micro, Desktop Publisher incorporates many of the features found on professional DTP systems costing many thousands of pounds. Desktop Publisher will give you the power to produce sophisticated documents; it will tackle anything from leaflets and posters to brochures, catalogues and newsletters. Desktop Publisher costs £59.95.

Desktop Publisher Special Edition is an enhanced, more powerful version for QL configurations with 512K RAM and a disk drive. It includes many enhancements which will enable the ambitious user to create more professional looking documents more easily.

It is recommended that DTP is used with quality WP and graphics software.

SPECIAL EDITION DTP £79.95
SPECIAL EDITION DTP & EYE-Q £104.95
SPECIAL EDITION DTP & SPECIAL EDITOR £114.95
SPECIAL EDITION DTP, SPECIAL EDITOR & EYE-Q £139.95
DEDUCT £20 FOR STANDARD DTP

£79.95
£104.95
£114.95
£139.95



MICROBRIDGE

Microbridge is a superb contract bridge bidding and playing program which can also teach bidding in a series of sixteen lessons used in conjunction with a brilliant manual.

The tutor is followed up with a virtually unlimited set of hands for further practice in bidding and play. Lots of fun.

Microbridge is one of the strongest bridge programs available for any computer. It understands many of the subtle elements of card play and never cheats by peeping at hidden hands. This makes it a challenge for skilled players as well as a non-abusive instructor for beginners. Microbridge's fluent commentary is a first in computing. **Microbridge requires memory expansion and disk drives and costs £34.95**

SUPER SPRITE GENERATOR

The ultimate tool for the creation of high quality high speed sprites, whether for fast action/adventure games or serious applications. Now the truly professional tricks of the top games programmers can be recreated with no machine code knowledge required on your part.

- 100% flicker free
- real time collision detection
- comprehensive diagnostics with error trapping
- Up to 256 multicoloured sprites and planes
- 16 frame animation

"The results that can be achieved are simply excellent" is what QL User said way back in 1985. Now with many more new enhancements.

£29.95 complete

SUPER MEDIA MANAGER

Frustration with corrupted data? Never want the experience? SMM provides everything you are ever likely to need in one integrated menu-driven package - and it's not just for what things go wrong.

- Copy any (yes, ANY) disk or cartridge
- Sector loading, copying and editing.
- Auto file recovery ● Directory sort
- String searching ● Hardware diagnostics
- Direct file copying from other disk for mats i.e. PC-DOS, MS-DOS, CP/M etc.
- Text file translation utility.

"The definitive blockbuster... includes every possible facility"

ONLY £39.95

Cartridge only version £24.95

SUCCESS

- The Supreme CP/M Code Emulation System

□ CP/M is the most widely implemented operating system. Famous programs like Wordstar, Supercalc, Symphony, Lotus 1-2-3, dBase and Perfect Writer, and a huge library of public domain software, is available to run under CP/M.

□ QL owners can break into this program bank using Success. Success stands for Supreme CP/M Code Emulation System. No knowledge of CP/M is required. A disk drive is necessary only for the original program transfer.

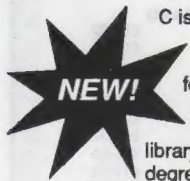
□ Success is much more than just a CP/M emulator. It has full QDOS file handling, ED line editor, 8080 assembler, PIP copier, creation of executable CP/M and all the CP/M utilities. What distinguishes Success is its absolutely phenomenal speed.

□ Success is designed for beginners, but the manual also contains detailed guidance for those who want to access CP/M and QDOS at machine code level. The extensive manual contains full details of where you can get cheap CP/M programs. Open up your QL to the enormous potential of CP/M NOW.



Nothing succeeds like Success - only £49.95

DIGITAL C



C is the best language. Digital C is both the best and the fastest C compiler available for the QL. Highly transportable: exceeds the Small C specification. The QDOS library gives the most complete degree of QL compatibility.

Digital C generates machine independent, compact, stand-alone, multitasking executable machine code. The supplied library manager and generator allows integration of C functions into library modules for later use. Ideal for a beginner, sufficiently sophisticated and advanced for a pro.

Complete with suer manual £39.95

RESS..STOP PRESS..STOP

Need guidance? Call/write for our new REVIEW DIGEST: a collection of independent critical press reviews. 52 page product brochure also available. Both free. Both different.

Coming soon. Accounting and office automation suite for small/medium businesses, with turnovers from £10 to £100,000,000. POLYMATH - full math/stats compendium: all the procs you never wanted to write, but needed to use.

Inside QDOS. The full 260 page ROM dis. Send your QL's serial no. and £29.95, quick.

Transfer utility. This will convert any unprotected cartridge program so that it runs from disk: you need Tebby's toolkit (almost certainly in your disk interface ROM) to run this. Cost £10.

Hardware. Interfaces from £70, RAM expansions from £50, interface plus RAM from £110, 3.5" DSDD drive from £125. Write for details

BETTER BASIC £24.95

Just that - a program that will improve all your programs. Analyses, corrects, and annotates Superbasic Programs. The program is totally user configurable and very easy to use.

"Excellent, a five star program". Sinclair User

SUPERFORTH V2.0 £39.95

The full multitasking, stand-alone, high speed Forth 83 system is supplied with an extremely powerful compiled Othello (which beat the 1983 World champion). Now with extended 100 page manual and full string handling. Fully compatible with 68000 code and QDOS.

ULTRAPRINT £19.95

Soup up your Epson/Okii compatible printer. 22 different type sizes and styles, giving you control over all aspects of text and graphic output. Easy to use, fast, multitasking and fully compatible with Eye-Q. Supplied with manual written for idiots.

DISKS FOR CARTRIDGES

Send us your working new/used microcartridges and we will send you brand new blank disks. One 5.25" for 2 cartridges; one 3.5" for 4. Minimum quantity 16 cartridges: no fractions!

PROFESSIONAL ASTROLOGER

The most advanced, accurate and extensive astrology package yet produced for any home micro. Professional Astrologer is suitable for those with advanced astrological knowledge, but can be used equally well by curious amateurs.

The program offers the most complete readout possible including ten pages of personality/character delineation, six pages of day-to-day and year-to-year personalised text predictions and three pages of 'synastry' text comparisons between two people. These are just some of the astrological features offered:

- Transits ● Progressions ● Seven house systems ● Individually adjustable orbs ● 158 birth data files ● Eclipses ● Closing aspect indicator

Professional Astrologer can be supplied with its complementary program; Professional Astronomer. This program features a full planetarium display, automatic parallax correction, planet faces and solar system display in parallel projection. Astronomer on its own costs £29.95.

"One of a kind...every requirement provided for...descriptions like superb, ultimate, excellent are hardly adequate" QL World

Professional Astrologer £59.95
With Astronomer £69.95

GAMES

BLOCKLANDS - fast addictive maze game with super-smooth multi-directional scrolling. £9.95.
DROIDZONE - The all time classic space shoot 'em up - astounding speeds. £9.95.
SUPER ARCADIA - Two games for the price of one! BMX burner is a 64 screen arcade adventure, + Grid Racer for only £9.95.
SUPER REVERSI - the strongest version of the classic board game around. £9.95.
SUPER BACKGAMMON - fast response, clocks, 3 play modes. Complete with rules. £12.95.
Any 3 for £24, any 4 for £30, all five for £36!

To: Digital Precision, 222 The Avenue, London E4 9SE or Telephone 01-527 5493

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Postcode

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Do you have 3.5" disks 5.25" disks Microdrives only

If you have disks, do you get 720 sectors 1440 sectors

COMPUTERS

| | |
|-----------------------|------|
| QL JS 2.3 software | £169 |
| QL640K JS 2.35 s/ware | £260 |
| Psion 2.3 sets | £10 |
| Psion 2.35 sets | £23 |
| (inc 2.38 Archive) | |

PSION ORGANISER

| | |
|---------------------|------|
| Organiser XP 32K | £138 |
| 128K Datapak | £100 |
| 32K D Rampack | £55 |
| Harvester Superchip | £99 |
| Data Organiser | £35 |

Z 88

| | |
|----------------------|---------|
| Z88 + mains adaptor | £297.50 |
| 32K Rampack | £20.00 |
| 128K Rampack | £50.00 |
| QL - Z88 link | £23.00 |
| Centronics interface | £30.00 |

TK

COMPUTERWARE

the QL stockist

Tel: 0303-81-2801

DISC SYSTEMS

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| Dual 3.5 in. + Trump Card | £350.00 |
| Single D/D 3.5in. drive | £125.00 |
| Single D/D 3.5 in. & 0K SQB | £225.00 |
| Dual D/D 3.5 in drive | £209.00 |
| Dual D/D 3.5 in. & i/face | £295.00 |
| Dual 3.5 in. & 512K SQB | £350.00 |
| Cumana disc interface | £ 86.25 |
| 768K Trump Card | £199.00 |

SPARES

| | |
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| JS ROM sets | £27.50 |
| Keyboard membrane | £6.25 |
| Keyboard bubble mat | £3.85 |
| ULA ZX 8301 | £9.50 |
| ULA ZX 8302 | £10.25 |
| MAB 8049 | £7.50 |
| CPU 68008 | £25.80 |
| M/drive assemblies- complete | £27.50 |
| Voltage regulator (high output) | £4.75 |
| Power supply UK | £23.50 |
| Power supply European | £25.50 |
| QL Test kit | £13.50 |

SUNDRIES

| | |
|---------------------------|---------|
| 10 Microdrive cartridges | £17.50 |
| Cartridge storage box | £5.50 |
| QL Dustcover | £5.00 |
| 100 Microdrive labels | £3.75 |
| Powerclean filter | £36.00 |
| Eprom Programmer | £129.00 |
| Battery clock kits | £19.50 |
| 10 DS/DD discs 3.5" (u/b) | £18.50 |
| Joystick + adaptor | £16.00 |
| 512K internal U/G | £94.00 |
| Centronics Interface | £19.50 |

SOFTWARE

BUSINESS

| | |
|-------------------------|---------|
| Flashback (c-d) | £25.00 |
| Cash Trader (PDQL) | £80.00 |
| Cash Trader + Analyster | £105.00 |
| Decision Maker | £35.00 |
| Entrepreneur | £35.00 |
| Financa Manager | £19.00 |
| Home Finance (Buzz) | £22.00 |
| Investment Monitor | £20.00 |
| Project Planner | £29.00 |
| Small Traders Pack | £25.00 |
| Spellbound (c-d) | £30.00 |
| Spellbound + Filebound | £35.00 |
| Touch Typist | £12.00 |
| Pacioll | £25.00 |

UTILITIES

| | |
|----------------------------------|--------|
| Archivist | £30.00 |
| Cartridge Doctor | £13.00 |
| Copymate | £11.00 |
| CPM Emulator (c-d) | £45.00 |
| Assembly Lang. Toolkit | £25.00 |
| Desktop Publisher | £60.00 |
| Desktop Publisher - S/Editor (d) | £80.00 |
| Front Page (c-d) | £23.00 |
| Front Page Extra 2 (c-d) | £40.00 |
| ArchRTM | £20.00 |
| ICE Eprom | £27.00 |
| ICE Drawing Office | £15.00 |
| Key Define | £10.00 |
| Locksmith | £11.50 |
| Mailfile (256K) | £20.00 |
| PCB Designer 1 | £99.00 |
| QFLASH Ramdisk + toolkit | £19.00 |
| QFLASH Ram Eprom | £25.00 |
| QFLASH Ram utilities (c-d) | £10.00 |
| Reconfigurable toolkit 2 | £29.00 |
| 4 Matter | £11.50 |
| Recover | £20.00 |
| Sideways | £20.00 |
| Sidewinder | £12.00 |
| Archive Tutor | £21.00 |
| Super Media Manager (d) | £40.00 |

XRef

| | |
|------------------------------|--------|
| XRef | £15.00 |
| Compare | £10.00 |
| Super Toolkit 2 (Eprom) | £29.00 |
| QIMI + Giga Mouse | £70.00 |
| QLiberator (c-d) | £60.00 |
| QLiberator (budget) | £30.00 |
| QLoad & Ref | £10.00 |
| Quats | £25.00 |
| QRam (c-d) | £30.00 |
| QWriter 2 | £20.00 |
| Task Master (c-d) | £25.00 |
| Speed Screen | £20.00 |
| The Editor | £29.00 |
| The Editor - special edition | £49.00 |
| Turbo (c-d) | £99.00 |
| Turbo Quill (c-d) | £10.00 |
| Turbo Quill + (c-d) | £13.00 |
| Ultra Print | £20.00 |

CAD

| | |
|------------------|--------|
| Concept 3D | £40.00 |
| Eye Q | £29.00 |
| Mandelbrot Magic | £15.00 |
| Sign Designer | £17.00 |
| TechniQL | £50.00 |
| The Designer | £15.00 |
| Viewpoint | £20.00 |
| 3-D Designer | £35.00 |

LANGUAGES

| | |
|------------------------|--------|
| Assembler Workbench | £25.00 |
| Basic-Ally | £20.00 |
| Better Basic | £24.00 |
| BCPL Development Kit | £51.00 |
| C Compiler | £85.00 |
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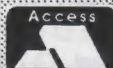
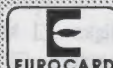
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SCENE

Digital Precision unwraps five packages

Digital Precision which, by its own admission had a quiet year in 1987 with only one all-new package, *Desktop Publisher* released, has five new programs for release. Four of the five should be available now and the fifth is scheduled for early February.

The first four programs, which Digital Precision supremo Freddy Vacher describes as "major," are *Success*, a CP/M emulation system; *Digital C*, a fast compact C compiler; *3D Graphics/CAD/Design System* — "the title says it all" — and *Microbridge*, a contract bridge player and tutor

Programmers

Inspired by the overwhelming success of Pro-CAD 3, Datanet Systems is expanding and developing a new range of packages for the QL. Consequently Datanet Systems is looking for new and established programmers to work on existing programs and to develop new ideas for the QL.

Datanet Systems is also offering the support and backing of an established company to programmers wishing to have their products marketed professionally. For further details contact Datanet Systems, PO Box 121, Luton, Bedfordshire LU1 5SY.

reviewed this month on page 29.

The fifth DP program is a flexible printer dump utility, *Ultraprint*.

Success, the "Supreme CP/M Code Emulation System," allows many programs written to run under the CP/M operating system to run on the QL. CP/M was developed more than a decade ago and has a large body of software written to run under it, including *WordStar*, *Lotus 1-2-3* and *dBase*.

Success takes Z-80 instruction groups from RAM, analyses them and executes the appropriate M68000 subroutines, operating at a speed equivalent to a 2MHz Z80.

CP/M BIOS hardware interfacing, BDOS file handling and CCP user communication are supplied. The BIOS gives the user seven drives — Microdrives, disc drives and RAMdiscs — and a flexible drive reconfigurator. The screen and printer ports are accessible, as well as two user-definable devices.

The package will give a contact address for a CP/M library — there is a great deal of software under CP/M in the public domain. A disc drive is necessary to capture the CP/M files but not otherwise.

Success, says DP, is designed for beginners but also gives guidance

for accessing CP/M and Qdos at machine code level via the BIOS. Success is £49.95.

The high-level systems language C is gaining steadily in popularity because it gives a high degree of control over computer operation without resort to machine code. Digital C compact C compiler is, says DP, "the fastest C compiler for the QL. Our priorities were speed of execution and compilation, flexibility and compatibility with Qdos." The C implementation has been made more powerful than Small-C but compact and "very-SuperBasic like" in consideration of QL users who have begun to use SuperBasic.

Digital C is written in the Digital C implementation. There is no need for RAM expansions, ROM add-ons, discs, or an excessive number of cartridges. Digital C is £39.95.

MicroBridge is a contract bridge bidding and playing program which teaches bidding with 16 lessons accompanied by chapters in the extensive manual. Deals can be selected to be random or biased in favour of the player and make other choices affecting the style of the game. The Acrol bidding system is used and is described fully in the manual. The program monitors the player's bidding and

gives advice, which can be over-ridden.

Alternatively, the player takes the role of declarer and plays the computer, which determines the other three hands, *MicroBridge*, says DP, "understands the subtleties of card play and never cheats by peeping at hidden hands." Deals can be played over and over again and there is a skill monitor. *MicroBridge* needs an expansion RAM and disc drive and costs £34.95.

Ultraprint provides 22 sizes and styles of graphic dumps from any Epson- or Oki-compatible printer, with up to five passes of the printer. The program also has special PCB dump modes which will produce perfect originals for reproduction from PCB screen designed on the Digital Precision *Eye-q*. *Ultraprint* has an explanatory manual and costs £19.95.

3-D Graphics/CAD System was scheduled for release on February 1. The menu-driven program includes a 3D toolkit for use with users' programs and features the fast operation and wide range of functions characteristic of many DP packages. *3-D Graphics* will cost £49.95.

For further details contact Digital Precision, 222 The Avenue, Chingford, London E4 9SE. Tel: 01-527 5493.

QL

SECTION

Freedom of the files

The National Council for Civil Liberties has produced a booklet briefing on the subject of the Data Protection Act, entitled *Your Right to See Your File*, which costs £1 inclusive of postage from the NCCL, 21 Tabard Street, London SE1 4LA. Tel: 01-403 3888. Two more extensive books on the subject are available from the NCCL.

Swedes are gathering in the North

It has been said that if two Swedes share the same interest they form an interest group and if there are three they start a magazine. In the experience of *QL World*, it does not require as many as three Swedes but a QL group has appeared with more than 400 Swedes under its aegis — the Svenska QL Gruppen of Sweden.

The group hopes to set up subgroups around Sweden, issues a periodic newsletter, *QLBladet*, has founded a software library in co-operation with the English QL group Quanta, gives courses in SuperBasic, the Psion suite, assembler programming and other subjects, and meets once a month at Chalmers

University of Technology, Goteborg and FOA in Linkoping.

Membership is 100 Sweden crowns payable to the Giro account 62 81 58-8 in the name of Svensak QL Gruppen for one year.

The group can be contacted at Svensak QL Gruppen, Toftaasgatan 73, s-421 47 Vastra Frolunda, Sweden.

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- **Sector Software** — 39 Wray Crescent, Ulnes, Walton, Leyland, Lancs. PR5 3NA. Tel: 0772 454328
- **PDQL** — Unit 1, Heaton House, Camden Street, Birmingham, B1 3BZ. Tel: 021-200 2313
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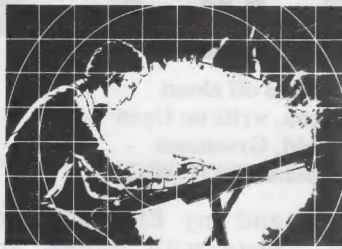
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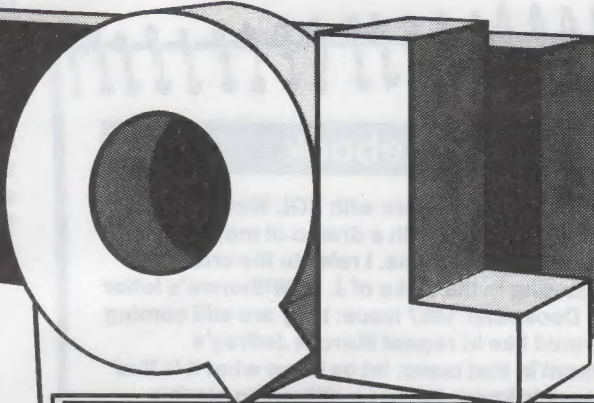
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with the answer, or just sound off about something which bothers you, write to: Open Channel, Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG.

Plea 1

I would like to say how much I agree with J. H. Witherow — Open Channel, December. I have not yet worked out how to load various utilities which I have, including Choice Toolkit, so that they can be used from memory. One loading eliminates a previous one. I am not unintelligent but I find that every book or manual assumes a certain degree of knowledge which not everybody has.

Take us by the hand and lead us to a satisfying use of a good com-

puter. Having typed-in the stock control system from the User Guide, how do I run it? I either get as far as Proc. Start, or get a CANNOT OPEN FILE message with Archive, of course.

Might I add how much I enjoy the Progs *Golf* by Shergold and Tose?

A. V. Vere,
Leamington Spa.

Plea 2

I am writing with regard to a letter from J. H. Witherow in the December *QL World*. Being a relative novice I can fully appreciate his feelings regarding jar-

gon and I would like to see some kind of two-page pull-out for beginners which could be put in a binder or folder for quick reference.

I would like to see Toolkit explained in a down-to-earth way. How does it work? What can I do with it? I have been using the QL User Guide from day one along with other computer books and I attend an evening class which I have found very informative. The fact that you can ask questions on the spot and receive an explanation at once is a great help.

I would like to get in touch with Witherow; perhaps we could exchange our problems and help each other in some way. I would like to hear from anybody who would like to contact me, so that we could perhaps form a QL Beginners' Club of some kind.

W. G. Johns,
12A Wenallt,
Dolgellau, Gwynedd,
North Wales,
LL40 1PW.

Plea 3

I have been trying to find courage to write to *QL World* for months. Now someone has done it for me. I must endorse his statements. I am two years behind Witherow, having 'gone QL' because of a bargain package too good to miss. Equipment has fallen into my hands which I fear I shall never understand.

I have read about my Assembler Workbench

and my Eidersoft complete with mouse and frankly the poor things will die of hunger before anyone shows me where to put the cheese. Will someone please explain in plain English what happens beyond the first few pages of the many books I have read? They start in the most exciting and interesting manner, only to descend into what I call "superior know-all" language.

J. G. Cooper,
Ilkley,
West Yorkshire.

Editor's comment: These are just excerpts from a sheaf of letters agreeing with Witherow. This underlines the point that many QL users are comparative beginners and that many others, beginners or not, love their QLs for their entertainment value rather than for more abstruse technical reasons.

QL World already has plans for a column for readers who want to extend their understanding of the QL and computing generally without descending to arcane depths. We hope to start it with the March issue.

Toolkit aid

Would you explain the extra commands in the Tony Tebby Toolkit? I am interested in the direct access file commands when used with Microdrive.

William Hitchins,
Blackburn.

Editor's comment: If anyone would like to write on the subject, please contact me.

Editor's notebook

Commencing my tenure with *SQL World*, I find myself face to face with a drama of modest but meaningful proportions. I refer to the cries for help coming in the wake of J. H. Witherow's letter in the December 1987 issue: they are still coming in. I would like to repeat Marcus Jeffrey's comment in that issue: let us know what it is that you want to know. It can be difficult to pin this down, I know, but the more comments we have on what newer users find puzzling, the better will we be able to do something about it.

An apology to everybody who is waiting for news of submissions to Microdrive Exchange or The Progs, and indeed to people who have had programs accepted and not yet published. It has proved more difficult than we anticipated to keep up a steady flow at this end, but we are hoping to have a new software editor starting shortly. That should make all the difference.

Happy New Year to one and all from everyone at QL World.

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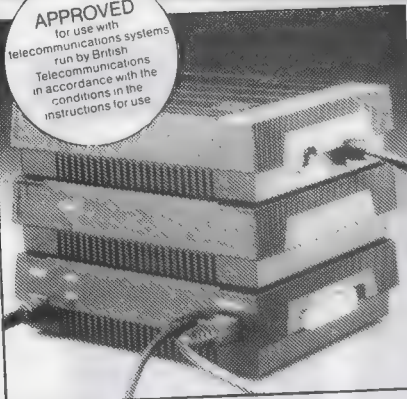
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THE

Thor RANGE

MONITORS

QDisc Interface



NEW

INTROM I AND

Thor SPEEDSCREEN

The Thor computer systems are professional business machines designed with the user and his future requirements in mind. CST have developed several models with either single or double 3.5in, NEC floppy or 20M SCSI hard disc and floppy, making the Thor extremely versatile. Thors are equipped with 640K RAM, parallel and serial printer ports, battery-backed clock and a separate IBM style keyboard. Supplied free with all Thors is a customised version of the award-winning Pelon Xchange software suite as well as ICE and T-dump. Special features of the Thor include multitasking at a single key stroke and enhanced screen windowing.

The Thor 20 system, using the high speed Motorola MC 68020 processor, delivers up to three times the computing power of the standard Thor. The Thor 20 package includes a suite of development software comprising a specially commissioned macro assembler by Talent Computer Systems and a linker by GST in addition to the Pelon Xchange business software together with full supporting documentation. The Thor 21 system is designed for "number crunching" applications. Based on the 68020 and additionally incorporating the MC68881 floating point coprocessor, the performance of floating point operations are dramatically improved — taking only 1% of the time taken without the coprocessor. This system is essential for a wide range of scientific and engineering applications and only costs an additional £201.25 (inc. VAT).

CST now offer a choice of monochrome or colour monitor suitable for use with the Thor range of computers. The Philips CM8833 14" colour monitor includes interface lead and screen. The Philips 7502 12" monitor has a dark anti-glare screen, horizontal/vertical size adjustment, position adjustment, brightness and contrast adjustment and a foldable foot. Both of these monitors have been selected by CST from the wide array of available monitors for their superior performance and reliability when used with the Thor computer range.

The best-selling floppy disk interface is fitted with a 16K EPROM containing many 'Toolkit' extensions, and CST's Ram Drive 2. It may be used with most 3.5 or 5.25 floppy disc drives. CST's own twin slimline double sided 80 track 3.5 units being exceptional value for money, with 720K of formatted storage per drive. The Toolkit provides a wide range of SuperBASIC commands and functions designed to improve access to the powerful facilities of the QL without the need for machine-code programming. Job control is made easier, files can be used for random access, alternative character sets can be produced, 'wild cards' can be used in file operations, etc.

The Ram Drive device driver allows free memory to be used as though it were a very high speed disc in fact the fastest such device when used with the RAM-plus. Ideally used for the storage of temporary results, or multiple screen images for animated displays, it also eases the copying of files in single disc systems. The Ram Drive can only use memory which is free, so the full advantage is only felt if the QL is equipped with additional memory. Built into QDisc 4 and Thor, the Ram Drive is also available on 3.5in. and 5.25in. floppy disc.

The CST RAM-plus unit expands the available memory of the QL to the limit of 640K. Using high grade 256K memory devices, this unit is the only one which offers the high performance of no waiting state operation. In fact the CST RAM-plus is the fastest ram expansion according to independent tests carried out by Digital Precision. Housed in a rugged metal case, the RAM-plus unit has an expansion slot which duplicates the QL's, allowing any other CST peripheral to be used with it.

CST are distributing two rom upgrades for the whole Thor range: SPEEDSCREEN & INTROM I. Installation costs a nominal £15 which covers return delivery, packing and insurance. Please insure your machine when you send it to us. Alternatively you can install the new roms yourself, instructions are included.

SPEEDSCREEN, using the new optimised code by Simon N. Goodwin, makes the Thor display up to twelve times faster. SPEEDSCREEN works with existing programs without alteration. Displays look just the same but are drawn much quicker. SPEEDSCREEN is also available on 3.5" or 5.25" floppy or microdrive for the QL.

INTROM I integrates the Talent Screen Editor., QJump's Toolkit II and Digital Precision's Turbo Toolkit SuperBASIC extensions and Buvex's Thor Dump screen dump into one package.

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Thor XVI: The Inside Story

"We're beginning to see light at the end of the tunnel" was how Graham Priestley, Production Manager at CST put it as the testing stage of the Thor XVI was drawing to a close recently, "I'm now keeping my fingers crossed that there won't be any major hitches with the initial production run!" he said.

CST have rejected the simplistic solution of stretching the 8 bit designs already in production; they have chosen a completely new architecture while still guaranteeing compatibility across their range of products from the 8 bit 68008 in the original Thor to the 32 bit 68020 used in the THOR 20.

CST's approach is "at least one microprocessor per user," and so the best way to produce a 'multi user' system is by networking independent machines, rather than expecting a single processor to handle several users at once.

TWO INTO ONE

CST are convinced that a large proportion of the common peripheral functions carried out inside a microcomputer actually slow the main processor down significantly. If these tasks are handled by a separate dedicated chip, the main processor is free to operate at full speed for the maximum

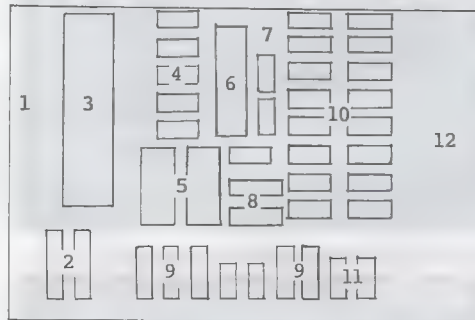
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Major Components of the Processor Board

amount of time. With this in mind the philosophy of the QL is continued, and there are TWO microprocessors in every THOR.

The main processor board of the THOR XVI contains a 68000 processor running at 8 Mhz. The onboard half Megabyte of memory is multiplexed between the processor and the video control circuitry, which generates a superset of the QL video modes. The expansion

memory slots allow up to 6 Megabytes to be added currently (with the new 4 Mbit devices this will be increased further). All input and output functions are carried out by a 2MHz 6802 on the I/O processor board, which is designed to be standard across the range of THOR machines. Video pixel rate is 10.67 MHz, which allows a 512 pixel per line display on a standard monitor without overscan. The

video modes now include a 16 colour facility for colour monitors which have an intensity input, or a 16, level grey scale in monochrome.

The QL compatible expansion slot allows the use of existing add on card (except memory).

PRINTERS ADD TO RANGE

CST have announced they shall be including printers in their range to coincide with the launch of the Thor XVI. "There has been a growing demand for complete systems," stated Stephen Gregg, Dispatch Manager. "However extensive trials were needed before CST could recommend any particular models." Those supported range from the workhorse Epson LX800 dot matrix at £287.50 to the fine letter quality Juki 6100 at £458.85.

Dear Hilde . . . THOR TIMES AGONY AUNT

I received my Thor recently and it has been in heavy use ever since. I am worried about overheating, as I can't hear the cooling fan and CST don't seem to understand my problem. Should I turn the air conditioning up?

Yours

Hot and Bothered
High St, Oman

Dear H and B

No sweat, your machine doesn't have a fan — it doesn't need one. The Thor has a well ventilated metal case and can take even your climate problems! It might be an idea not to leave your Thor out in the rain too often though.

Keep Cool!
Hilde

Next Month: The XVI's Inovative I/O Processor

SOFTWARE FILE

Imagine

Price: £19.95
Shadow Games, 1-2
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Combining the best features of maze, magic and monsters with a Sherlock Holmes-type flavour, the Shadow Games newest release, *Imagine*, is the first of what is almost certainly likely to become a steady supply of text adventures provided with interactive graphics to add atmosphere and player participation.

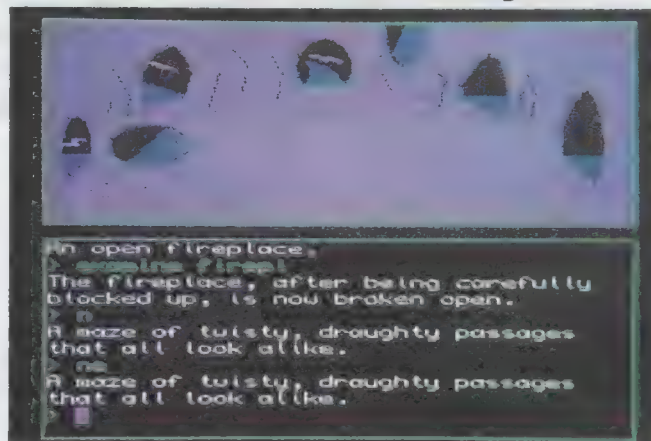
A game requiring something of an analytical approach to solve the many puzzles used to provide hours of entertainment, *Imagine* has been in the development stages on a variety of computers for more than two years. The original version was written in Fortran on a DEC mini-computer and, almost paradoxically, was the reason why the APT adventure-writing system was developed.

The starkly-illuminated opening scene of *Imagine* reveals a vast room in which you see a large box of the packing crate type — enclosing an informative note — and a torch. Initial play requires that you pick up or touch various objects contained in the vast room. *Imagine* has two features which I will not spoil by describing them in detail. Suffice it to say that, once you have left

Improvements in text compression now permit more sophisticated adventure writing for the QL. Cordelia Bloom tries one of the newest.



Imagine: in the middle of the floor sits a large box . . .



. . . and draughty passages twist into the distance.

the vast room after collecting particular objects, you have to navigate a series of caves and tunnels to reach the orange room.

From the orange room you must negotiate a complex maze to find the delightfully Nagging Wife. Altogether, *Imagine* includes about 100 locations, 70 objects — some of which are not immediately apparent to the player — and a 350-

word vocabulary, all of which will run on a standard 128K QL.

One of the most appealing aspects of *Imagine* is that all the information you need to complete the play successfully is included in the game. Ample clues, including a map at one of the locations showing you how to negotiate the maze, are provided and I recommend that you have pencil and paper to

hand for mapping your routes.

Imagine aptly demonstrates just what the APT system is capable of doing. You may save your current position at any time and, if you meet an untimely end, you can re-start the game from the position saved. Various objects may be set alight en route and PT multi-tasking QFill routines adds considerable realism to the occasion.

The APT auto-repeat feature allows you to enter a previous command by pressing the down cursor key. Dialogue with the game requires minimal typing. Although this APT adventure follows the usual conventions of entering "e" for east and so on, one of the features of the system is that, so long as the characters entered are distinctive to the word required, it will be allowed as if the word were spelt in full.

Thus, to find the state of your health, the parser will require a minimum of the first four letters to indicate exactly which word you wish to enter. If you type only "he," the APT system will prompt for a better indication of the word you require.

After playing *Imagine* far longer than was required to complete this review, my feeling is that it has combined the best elements of humour admirably with sound principles of program flow and logic. Packed with features, *Imagine* is lively and full of fun and destined to become a QL classic.

Take the brakes off your QL display!

SPEEDSCREEN

If you're frustrated by slow QL displays, SPEEDSCREEN is the answer. It replaces Sinclair's slothful screen routines with a new code that's up to TWELVE TIMES FASTER. It makes virtually all QL software much friendlier and more responsive.

SPEEDSCREEN speeds up text and user-defined graphics output by up to 12.6 times. Window cleaning and cursor operations are much quicker and scrolling can be 8.2 times faster. As QL WORLD reviewer Mike Lloyd put it last month:

"The speed increase is phenomenal . . . SPEEDSCREEN does everything Creative CodeWorks claims . . . the package is well thought-out, thoroughly tested, easy to use and sensibly priced.

"It has the advantage of enhancing almost every piece of software available, and does so without imposing restrictions and without requiring any computer literacy from the user . . . SPEEDSCREEN will be very popular indeed."

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QL SPEEDSCREEN costs £20 on disk or tape (please state) inc. first class or airmail postage anywhere. PAYMENT MUST BE IN STERLING: UK P.O.'s, Eurocheques, Bank Drafts or cheques drawn on a UK bank. 7 day service.

SPEEDSCREEN is also available NOW, in ROM form only, for users of the CST THOR, price £30. A QL ROM cartridge version will be launched on 27/1/88, priced £30. All versions come with a full manual, new character sets, a design utility and toolkit commands.

The next program from Creative CodeWorks is **QUICKFAX** — a 'card-file' database that is easy to use and very fast.

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SUPER BASIC

Mike Lloyd explores stacks and queues and discovers a maze-searching algorithm

Vectors, or single dimensional arrays of fixed length were introduced in last month's SuperBasic feature. The discussion led to a look at multi-dimensional arrays which can be regarded as being many identical vectors arranged side by side although, in fact, arrays are conceptually unrelated to vectors. This month's article also takes vectors as its starting-point but develops the theme in an entirely different direction.

Vectors are only one member of the family of linear lists, the simplest of data structures. It will be recalled that a vector is an ordered set of a fixed number of like values held in a relatively inflexible way. Linear lists in general have fewer limitations than vectors. One definition of a linear list is "a set of homogenous values whose structural properties comprise only the relative positions of the values."

In simpler terms, a linear list is a collection of similar values linked one to the next. Every item except the last in the list has a single successor and every item except the first has an exceptional predecessor, making the whole data

set one-dimensional. The major differences between linear lists in general and vectors in particular are that linear lists are dynamic and they do not necessarily rely on the physical locations of the data to indicate their order. Linear lists can therefore grow and shrink as items are added and deleted and elements can be arranged physically in one order and accessed in another.

When the relationship between one item and the next is simply that it is next to it, the link is said to be implicit. Most lists have implicit links between their elements. Telephone directories have their elements arranged in alphabetical order; it is not necessary to include a reference after each name to indicate where the next name is to be found.

Links

The same is not true of entries in a thesaurus, where words are arranged in groups according to their meaning. Entries frequently include cross-reference to related word groups, representing explicit links between one word and its logical successors. A special index is required to locate given words and their synonyms.

Travel directions can be given in the form of a list with explicit links: Lichfield, A38; Birmingham, M5; Gloucester, A40; Cheltenham, STOP.

Each town is followed by a link to its successor. This structure is very different from that of a two-dimensional array because its elements are not necessarily homogenous; town names are character strings while road numbers might be coded into integers. In explicitly-linked data structures, the road names would be replaced by the memory address of the next element.

A full examination of linked lists belongs elsewhere in this series. The other difference between vectors and lists is that lists can grow and shrink. This month's article highlights some special dynamic lists which could have either explicit or implicit links. To reduce complications, however, the examples used are all linked implicitly.

A surprising number of operations can be carried-out on lists of information held in a computer. Some of the more useful are:

Accessing, i.e., reading or altering the n th value.

Inserting a new value after the n th value.

Deleting the n th value.

Counting the number of values in the list.

Sorting the values into order.

Searching for a particular value.

Linear lists

Programmers rarely need to implement all those operations on a particular list. It is particularly irksome to have values inserted or deleted within the body of an implicitly-linked linear list because of the disruption it causes. Additions and deletions therefore are frequently limited to either end of the list.

Stacks are linear lists which allow changes to be made to their contents only at one end. An analogy is from card games like rummy where cards are discarded on to and picked up from the top of the pack. The last known card to be discarded is the next card to be picked up, a concept known to accountants as Last In, First Out. Stacks are sometimes called LIFO lists.

A less satisfactory analogy is that of the machine for storing plates which are sometimes seen in cafeterias. As plates are added to the stack its spring-loaded based descends to that only the top plate is accessible. This analogy

has given rise to the expression to *push* a value on to a stack and to the term *push-down stack*.

The stack elements do not move when new values are added — the stack grows taller. Neither are lower values entirely inaccessible, because they can be read and even altered. *Stack* is just one of the many misleading computer descriptions which were intended originally to be helpful.

The opposite process of pushing items on to a stack has been dubbed *popping*. Once again a colourful analogy distorts the truth, because all that happens is that the "top of stack" pointer is moved down one position. The value thereby excluded from the stack is not obliterated until a new value is pushed on to the stack which over-writes it. Listings one to four allow a stack to be defined and operated on.

There are many uses for stacks, some of which will be the subject of future articles, but an interesting demonstration of the power of stacks is shown in the accompanying feature on maze searching, which uses the PUSH procedure and the POP function listed.

Restricted

Although stacks are dynamic structures they are ultimately restricted by the memory space allocated to them. An over-estimate of the stack's memory requirements will waste space, while an under-estimate will cause usually fatal overflow error. Overflow might lead to a program being abandoned or a routine might be called to release more space for the stack. The QL is particularly well-suited to

overflow recovery routines because programs, data and system blocks can be moved round in memory.

Sometimes more items are removed from a stack than there are additions made to it and therefore the stack becomes empty. This condition is known as underflow and can be dealt with either by abandoning the program or by finding some new values, real or dummy, to make up the shortfall. In the listings overflow and underflow halt the program.

Overflow

Stacks rarely need to grow to anything like the maximum size suggested by the data they handle, so memory can be allocated by estimating the most likely stack size and adding a percentage for luck. Highly-complex algorithms have been developed to improve the accuracy of estimates for memory requirements but the process remains uncertain.

Where a program has more than one stack they could share a single memory area. Two stacks can be anchored at either end of their shared memory area and grow towards the middle so that only when the combined size of both stacks exceeds the allocated space does an overflow occur.

Where more than two stacks exist some of them will have to "float" the memory space. Two pointers will be needed for each stack, one to point to the stack's working end and the other to indicate the base location of the first item. When two stacks collide, more room is obtained by re-locating one or more of the stacks.

Algorithms to perform this task intelligently

Listing 1

```
100 REMark establish STACK
110 Max = 500
120 DIM Stack (Max)
130 Ptr = 0
```

Listing 2

```
200 DEFine PROCedure Push (Value)
210 Ptr = Ptr + 1
220 IF Ptr > Max
230 PRINT#0; "Overflow": STOP
240 ELSE
250 Stack (Ptr) = Value
260 END IF
270 END DEFine Push
```

Listing 3

```
300 DEFine FuNction Pop
310 IF Ptr = 0
320 PRINT#0; "Underflow": STOP
330 ELSE
340 Ptr = Ptr - 1
350 RETURN Stack (Ptr + 1)
360 END DEFine Pop
```

Listing 4

```
400 DEFine FuNction Access (Offset)
410 IF Ptr - Offset < 0
420 PRINT#0; "Underflow": STOP
430 ELSE
440 RETURN Stack (Ptr - Offset)
450 END IF
460 END DEFine Access
```

can be complex. As the total available space fills there is a stage when the stacks are moved so frequently that the program is seriously degraded. This occurs typically when the memory area is between 75 percent and 90 percent full, depending on the number of stacks and the efficiency of the algorithm.

Queues share some of the features of stacks, the main difference being that additions and deletions are made at different ends of the structure. The obvious

analogy is a bus queue — people join the queue at one end and board the bus at the other. Like stacks, queues have a variety of computing applications. A common example is a keyboard or printer buffer which accepts characters for printing at one end and removes them at the other. The process is described aptly by the accounting term First In, First Out.

Queues need two pointers, one to indicate the head, where deletions are made, and





the other to indicate the tail, where additions take place. Computer queues normally do not shuffle up like a bus queue when elements are removed; all that happens is that the head pointer is altered. Busy queues can therefore be very inefficient because the head and tail pointers can stride through enormous amounts of memory without becoming more than a handful of data positions apart.

Least helpful

The least helpful cure for this problem is to allocate more memory space into which the tail can move; it is made only slightly more acceptable if the memory space abandoned by the head pointer is reclaimed somehow. Another possibility, almost as unhelpful, is to keep the head location static and move elements towards it; this is time-consuming even in machine code.

A more useful algorithm is to re-set the queue to the beginning of the memory space whenever it becomes empty. Another is to force the queue to be acted on, and therefore emptied, whenever it becomes full. The latter suggestion is commonly used in printer buffers, the algorithm being extended so that the queue is flushed if the channel to which it belongs is closed.

The easiest way to

The most efficient maze-searching algorithm has long been a holy grail for programmers. The objective of the exercise is to give a computer-controlled mouse sufficient intelligence to find its way out of a maze in the shortest time and with the fewest moves. Apart from basic rules governing the construction of the maze and the way the mouse reads the maze map, the programmer has complete freedom about the way the program is written.

A maze is a grid of squares in which some squares represent impregnable walls and others represent paths. The mouse begins its search anywhere in the maze and its goal is the home square at the edge of the maze which represents escape. Only vertical and horizontal movements are allowed. The paths are one square wide and must not form loops. The finished maze looks rather like a crossword puzzle and is represented in the computer by a maze map

make use of otherwise dead space is to make the queue circular, so that when the tail pointer reaches the final data position in the memory area it then moves back to the first data position. Of course, by that stage elements will have been removed from the head of the queue, thus creating space at the beginning of the data

Amazement meets

Listing 4

```

800 DEFine PROCedure Init
802 LOCAL x, Row, Col
804 RESTORE 836
806 Size = 16: DIM Map$(Size, Size)
808 FOR x = 1 TO Size: READ Map$(x)
810 WINDOW 512, 256, 0, 0: PAPER 0: CLS
812 WINDOW 308, 190, 102, 32: BORDER 5, 36
814 INK 7: CSIZE 3, 0
816 FOR Row = 1 TO Size
818   FOR Col = 1 TO Size
820     IF NOT Map$(Row, Col)
822       BLOCK 16, 10, (Col) * 16, (Row) * 10, 34
824     END IF
826   END FOR Col
828 END FOR Row
830 Max = 100: DIM Stack (Max): Ptr = 0
832 Push 0: Home = 258: Mou$ = CHR$(163)
834 END DEFine Init
836 DATA "0000000000000000"
838 DATA "0101001011111111"
840 DATA "0111110001000000"
842 DATA "0001001011111010"
844 DATA "0111001010001010"
846 DATA "0101101111110010"
848 DATA "0100110010101110"
850 DATA "0101010100101000"
852 DATA "0111011101101110"
854 DATA "0101010101001000"
856 DATA "0101011011111010"
858 DATA "0011101010100110"
860 DATA "0110101000100010"
862 DATA "0101101001010100"
864 DATA "0101001111111110"
866 DATA "0000000000000000"

```

formed by a string array with zeros for walls and ones for paths.

The mouse detects whether the four squares adjacent to the square it is occupying are walls or paths by reading the maze map. The mouse cannot alter the maze map.

The simplest search algorithm in this type of maze is to tell the mouse always to follow the walls on its left, because by doing so it must eventually reach the home square. That is too easy. A better method, involving only slightly more computing power,

which eventually would become inefficient, as the available free space reduced to about 20 per cent of the total memory area. Clashes would occur more often where some busy queues were intermingled with slowly-moving queues.

The final member of this class of linear lists is the double-ended queue or *deque* — pronounced deck. Like the dealing action of a cardsharp, additions and deletions can occur at either end of a deque. Deques can be considered as being either two queues or two stacks added together but, whereas stacks have tops and queues have

area. Overflow would occur only if the tail caught up the head. Listings 5, 6, 7 establish a circular queue in a SuperBasic array.

It is possible to operate several queues in a single memory area, all chasing each other round in a large circle. Clashes would have to be resolved by shunting down whole queues

Listing 5

```

500 REMark establish QUEUE
510   Max = 100
520   DIM Queue (Max)
530   Head = 1: Tail = 1

```


a mouse in a maze

can be described as follows:

1, Proceed until the exit is found or a dead end is reached.

2, If a dead end is reached, backtrack to the last unexplored turn-off.

3, Never explore anywhere twice.

Listing nine converts these rules into a SuperBasic procedure. A single stack is used to hold map references for each location and the illegal directions relating to each location. Illegal directions are those blocked by a wall square and those which the mouse has visited previously. When the mouse is searching new territory in accordance with rule 1, the algorithm works as follows:

Find current square by taking top value from the stack.

Fetch the list of "illegal" directions from the stack.

Check each direction in turn.

If a legal move can be made then:

Amend "illegal" direc-

tions accordingly.

Return "illegal" and "current location" values to stack.

Move forward.

When the mouse is backtracking under rule 2, the stack operations are:

Remove the last location and "illegal" analysis values from the stack.

Move to that location.

If the location is a junction, check for previously unexplored directions.

If there is one, take it.

If not, keep backtracking.

The mouse will search exhaustively all possible options until it finds the exit and at the finish the shortest possible route between its starting-place and the exit will be stored on the stack.

The maze can be redesigned by amending the data strings. New values of MAX can be used to change the size of the maze. The behaviour of the mouse can be altered by amending the search_maze procedure.

Listing 9

```

900 DEFine PROCedure Maze
902 LOCAL Here, Illegal, New_way, Loop
904 REPEAT Loop
906 Here = POP: Illegal = POP: Show Mouse
908 IF Ptr = 0: Illegal = 15 - Analyse
910 IF Illegal < 15
912   LoP = 15 - Illegal
914   FOR New_way = 0, 1, 2, 3
916     IF 2^New_way && LoP
918       Push Illegal + 2^New_way: Push Here
920       SElect ON New_way
922         = 0: Here = Here - Size
924         = 1: Here = Here - 1
926         = 2: Here = Here + 1
928         = 3: Here = Here + Size
930       END SElect
932       IF Here = Home: EXIT Loop
934       LoP = Analyse
936       Push 15 - (LoP - 2^(3 - New_way))
938       Push Here: EXIT New_way
940     END IF
942   END FOR New_way
944 END IF
946 END REPEAT Loop
948 BEEP 25000, 1, 20, 400, 30
950 AT Home MOD Size, Home DIV Size:PRINT CHR$(183)
952 END DEFine
  
```

Listing 10

```

1000 DEFine PROCedure Show_Mouse
1010 LOCAL x, y
1020 x = Here DIV Size: y = Here MOD Size
1030 OVER -1: AT y, x: PRINT Mou$
1040 BEEP 1000, 100, 3, 500, 200, 2, 12
1050 PAUSE 5: AT y, x: PRINT Mou$: OVER 0
1060 END DEFine Show_Mouse
  
```

Listing 11

```

1100 DEFine Function Analyse
1110 LOCAL x, y
1120 x = Here DIV Size: y = Here MOD Size
1130 RETURN 8*Map$(y, x+1) + Map$(y, x-1) + 4*Map$(y+1, x) + 2*Map$(y-1, x)
1140 END DEFine
  
```

The maze listings, lines 800 onwards, refer to listings two and three

which should also be entered before the program is run.

heads and tails, it is best to think of deques as having left and right ends.

Simplex

The operation of a deque is simpler than the number of addition and deletion options might suggest because only two pointers are needed. Overflows occur whenever one end or the other reaches the bounds of the reserved memory area and underflows occur if the pointers both point to the same position when a read operation is attempted.

Extra limitations can

Listing 6

```

600 DEFine PROCedure Add (Value)
610 IF (Tail + 1) MOD Max = Head
620   PRINT#0; "Overflow": STOP
630 ELSE
640   Queue (Tail) = Value
650   Tail = (Tail + 1) MOD Max
660 END IF
670 END DEFine Add
  
```

Listing 7

```

700 DEFine Function fetch
710 LOCAL Temp
720 IF Head = Tail
730   PRINT#0; "Underflow": STOP
740 ELSE
750   Temp = Queue (Head)
760   Head = (Head + 1) MOD Max
770   RETURN Temp
780 END IF
790 END DEFine fetch
  
```

be imposed on deques, for instance by allowing additions or deletions to be made only at one end. These are known as either input-restricted or output-restricted deques.

Implicit-links linear lists are flexible, powerful data structures, but they still have disadvantages imposed on them by the lack of explicit links between one item and its logical successor. This theme will be resumed when data structures are returned to in the not-too-distant future but next month's SuperBasic column will be tackling a different topic.

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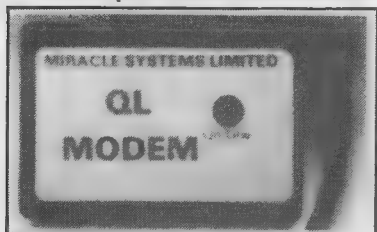
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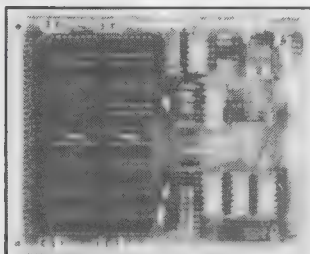
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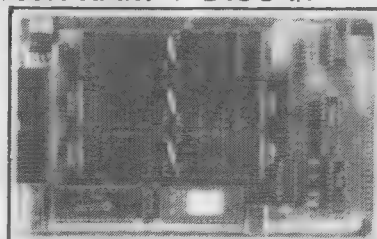
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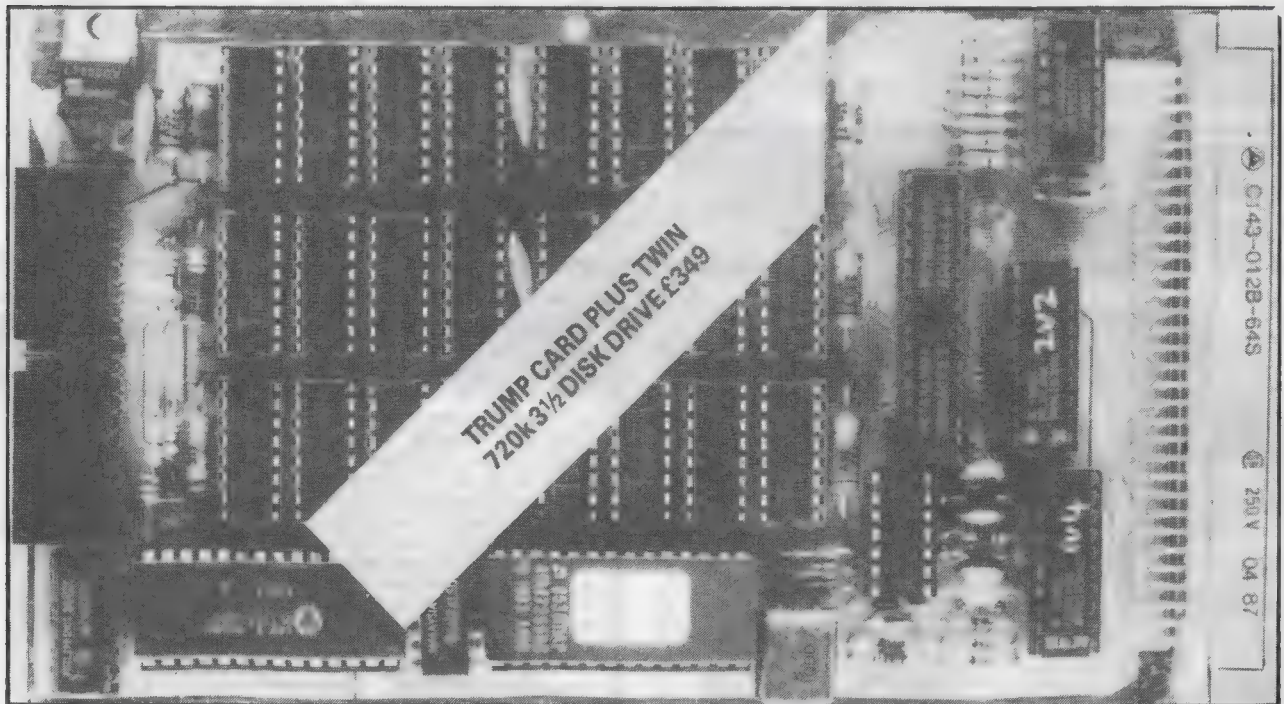
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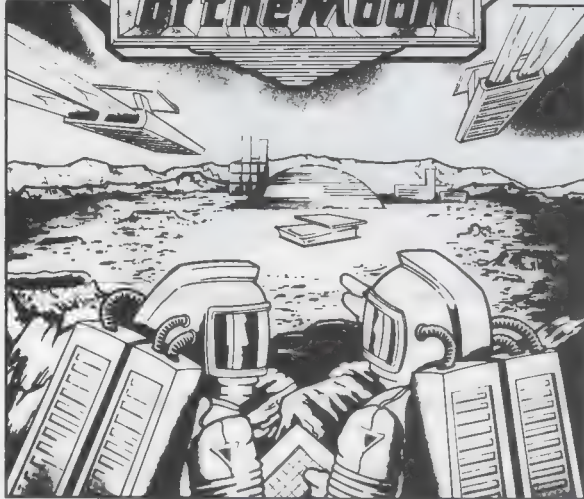
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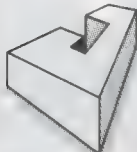


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Programmers utilising techniques applied in expert systems — programs in which the knowledge of a highly-skilled person is used to form the framework or rules of its operation — have been finding increasingly wider applications in the field of leisure activities. Although common use of expert systems on the QL curiously has taken much longer than one might expect, various developments have provided an accurate indication of the many possibilities in which the QL is particularly adept.

Of its nature, Contract Bridge is only one of the many fields in which the use of expert structuring of the formal aspects of Bridge has benefitted both active and potential player alike.

Expert systems

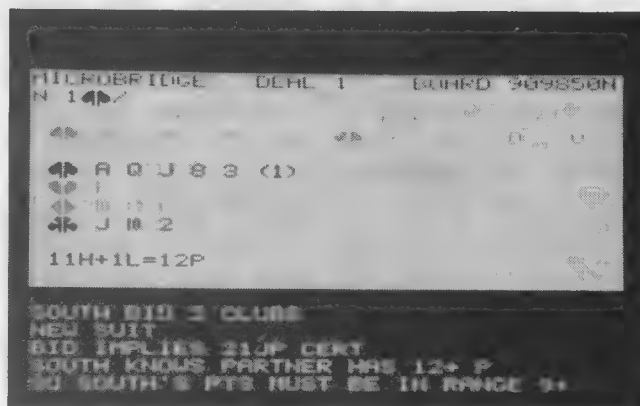
There can be little doubt that Contract Bridge is the most popular of all card games and is enjoyed worldwide as a social pastime. Leaping into the breach again, Digital Precision has released another program with epic proportions.

MicroBridge, one of those rare programs which may be described with equal accuracy as a game, a tutorial and a leisure activity, is a decidedly user-friendly system with which you may learn the more esoteric aspects of Bridge and have a vehicle with which to practise your new-found skills. *MicroBridge* includes some of the ideas used in expert systems to make the program more informative.

If not properly defined, algorithms establishing the parameters used to control Bridge, Chess or any other game where

A bridge goes far

Ron Massey finds that *MicroBridge* is a friendly partner in the great card game.



Program: *MicroBridge*. Price: £34.95. Source: Digital Precision, 223 The Avenue, London E4 9SE. Tel. 01-527 5493.

strategy plays an important part, can provide a means whereby cheating by the computer can occur.

This is most noted in games which, by their nature, all the information regarding the play is not readily available and the "hidden" hands are fluid in that, with a little study of the "opposition's" play, you will find that cards or pieces being played are not where you would expect them to be. In effect, card values dealt and played by the machine seem to shift between the synthesised players.

Problems with some of the other Bridge programs can occur where a limited number of variations are available and, if played often enough, there is a high degree of predictability. Even more common, the hands held by the computer contain certain

characteristics, such as an opening hand with a specified strength or point value or always strong and a particular suit combination.

MicroBridge has been biased towards the player; with any given hand you have the opportunity to make your contract or not; the QL will play the "hidden" hands in an attempt to prevent you from making your Contract. In a manner of speaking, this is not a Bridge program in the usual sense but one is designed first to be instructive and second fun to play.

Inferences

One of the features found in other Bridge programs and not included in *MicroBridge* is a score card in the conventional format. To do so with this particular program would

obviously have been misleading.

Unlike Chess, where all the information regarding the strategy of a game is visible at every stage of play, Bridge is largely a game of inference. Both your partner and the opposition must draw whatever information about your hand that they can by the way bidding proceeds and the way a hand is played. The manner in which this occurs is governed by formalised rules governing the process of bidding.

MicroBridge uses the Acol bidding system. Deriving its name from a road of the same name in Hampstead, London, about 50 years ago, the system used by the Acol Club has been adopted throughout the UK as the principal Bridge system used to govern the rules of play.



A bridge goes far

MicroBridge also observes Stayman and Blackwood conventions — subsystems used optionally in the Acol system. The former is a convention used in No Trump bidding to explore the possibility of a better suit. The Blackwood convention is a formalised procedure used when going for a slam.

While the technique governing play is relatively easy to acquire, one of the most important facets of Bridge is the art of concise strategical communication between you and your partner. One of the most difficult aspects of Bridge for beginner and experienced player alike is developing the skill of effective bidding.

MicroBridge is provided with a tutorial which teaches bidding with a series of 16 lessons, each devoted to a particular aspect or theme. Each chapter in part two of the extensive manual corresponds to each of the lessons provided in the tutorial bidding exercises.

Teaching mode

All bids must be legal but MicroBridge will allow you to force silly bids, which can be used for experimental purposes, if you wish to do so.

When up and running, MicroBridge asks if you would like to start with a lesson or a practice session. If you opt for the teaching mode you will be asked to enter one of the 16 lesson numbers devoted to a particular aspect or theme. You will also be asked for a lesson

number and a deal number. Having entered that information, you will then be presented with the bidding screen.

The MicroBridge bidding screen is divided horizontally into two windows. The upper window provides information regarding your current hand, icons representing the four suits and values held for each suit, lesson number, deal number, board number bidding information and probably points based on the bids made.

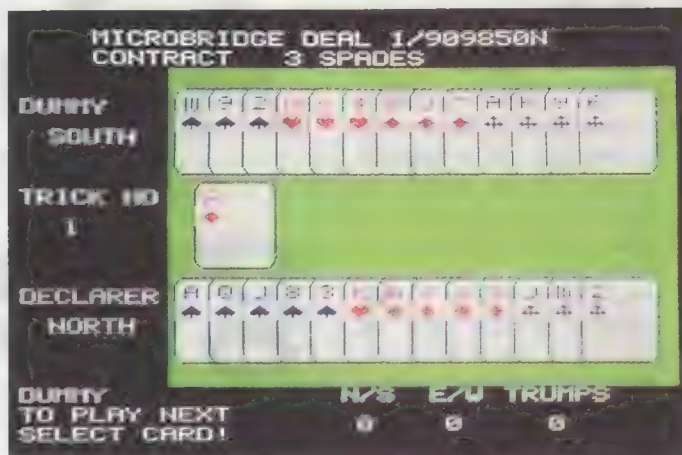
Interaction with the displayed hand is made in the lower window and, whenever a screen prompt is flashing, you have the option of pressing <Q> to query the reasoning which produced the decisions made by the program.

Better bid

If your bid is not successful or if a better bid is possible, you will be advised that your bid is valid, but that a better bid may be made. In some cases, you will be advised that you can force the program to accept your bid by pressing <Z>.

Pressing <SPACE> at any point in either a lesson or actual play will perform the step-by-step bidding automatically; if you are not sure of what bid to make, it will select the most optimal bid possible. Pressing <SPACE> will also go to the next stage in either a Lesson or stage of play.

After completing your bid successfully you are offered the option to repeat the sequence, re-



When playing the computer, the player can elect to be dealer, North or South, or for the hands to be rotated.

At the end of play, all four hands are displayed. The player can then play the same hand again, or try another hand.

view the bidding sequence, or complete the bid with the dealt hand.

If you opt to complete the bidding optionally you may enter the bids for your partner or, by pressing <SPACE>, accept bids made by the QL on your partner's behalf. Once that has been completed you may

bids, partner bids and experimental bids. Early lessons also demonstrate how the features of MicroBridge can be used to best advantage.

Each lesson provides several hands, corresponding to specific combinations of cards — referred to as board numbers in the screen information — resulting

TABLE 1

| Lesson | Number of boards |
|--|------------------|
| 1 Opening the Bid | 26 |
| 2 Following through an Opening 1NT | 29 |
| 3 Other routes to Game after an Opening 1NT | 29 |
| 4 Responding to Game after an Opening 1-suit Bid | 48 |
| 5 Continuing the Bidding | 63 |
| 6 More Opening Bids | 63 |
| 7 Showing Strength | 36 |
| 8 The Preference Situation | 38 |
| 9 The Fit Situation | 57 |
| 10 Strong Opening Bids | 39 |
| 11 Following through an Opening 2 | 62 |
| 12 Going for a Slam | 35 |
| 13 When the Opener Passes | 13 |
| 14 Odds and Ends | 10 |
| 15 About Pictures | 9 |
| 16 The Strong No-Trump | 24 |

repeat the bidding sequence with the same hand, review the sequence of bidding just completed or go on to the next deal in the lesson sequence.

Progression through the range of MicroBridge lessons will provide you with practice in making

in different permutations of deals with which to practise. Each of the hands is chosen so as not to anticipate later lessons.

The number of different boards available to the lesson mode vary with the lesson number — see table one.

MICROBRIDGE DEAL 1/909850N
CONTRACT 3 SPADES

SOUTH

| | | | | | | | | | | | | |
|----|---|---|----|---|---|---|---|---|---|---|---|---|
| 10 | 9 | 2 | 10 | 6 | 4 | Q | J | 7 | A | K | 9 | 6 |
| ♠ | ♠ | ♠ | ♥ | ♥ | ♥ | ♦ | ♦ | ♦ | ♣ | ♣ | ♣ | ♣ |

WEST

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| K | 7 | 5 | 4 | J | 7 | 5 | 3 | 9 | Q | 5 | 4 | 8 |
| ♠ | ♠ | ♠ | ♠ | ♥ | ♥ | ♥ | ♥ | ♦ | ♣ | ♣ | ♣ | ♣ |

NORTH

| | | | | | | | | | | | | |
|---|---|---|---|---|---|----|---|---|---|---|----|---|
| A | Q | J | 8 | 3 | 7 | 10 | 5 | 6 | 9 | J | 10 | 2 |
| ♠ | ♠ | ♠ | ♠ | ♠ | ♥ | ♦ | ♦ | ♦ | ♦ | ♣ | ♣ | ♣ |

EAST

| | | | | | | | | | | | |
|---|---|----|---|---|---|---|---|---|---|---|---|
| 6 | A | 10 | 8 | 5 | 2 | 9 | 4 | 9 | 4 | 8 | 7 |
| ♠ | ♥ | ♥ | ♥ | ♥ | ♥ | ♦ | ♦ | ♦ | ♣ | ♣ | ♣ |

7 TRICKS WON BY N/S & 6 BY E/W
CONTRACT NOT MADE - HARD LUCK!!
REPEAT [R], REPLAY [P], RESTART [S] OR
NEXT DEAL?

Although the 16 lessons have been selected to present the best examples of each type of situation covered by the respective lesson, additional practice may be acquired by not selecting the <P> option at the end of the bidding session, when in the PLAY mode. Game boards will then be presented either sequentially or by a specified number.

Hand reading

Perhaps more important than the bidding, MicroBridge also teaches you how to draw information about your partner's hand by the way the bidding progresses through a given hand.

The PLAY mode provides you with a number of options so that you may tailor your game to your particular requirements and interests:

1. Whether you wish to play NORTH or SOUTH.
2. Whether or not you wish to rotate the card deal.

3. The option to have normal or extra strong hands.

4. Input of the name of the NORTH position player.

5. Starting with a particular board number.

You may elect to be North and be the dealer for every play or, as in a real game, elect for the deal to rotate. In either case, your hand alone will be displayed on the screen. If you opted to be the dealer, you will bid first, with the options to devise your bid and key it in or, if you wish, you may press <SPACE> and the QL will enter your bid for you.

Options three and five are related in that, if you opt for a normal hand, you can have either a specified or a randomly-generated board number. Selecting the option for a strong hand enables you to play game boards in the range of 800,000 to 999,999. Including every possible permutation provided by MicroBridge, you can have millions of hands available.

If you enter <ENTER>

in response to the prompt for a board number, you also have the option of entering strong or weak No Trumps (NT). Starting with any specified game board, you may either proceed with bidding in sequential hands or, by pressing <P> go on to play the hand with which you have just completed the bidding. Bidding may proceed in either of three ways:

- ★ You may bid manually, as is done in the lesson mode.

- ★ You may press <SPACE> and accept the program's bids, step-by-step, also as done in the lesson mode.

- ★ By pressing <CTRL> <A> at any stage of the bidding sequence, have the bidding entered automatically.

The latter option is particularly useful if you are an experienced Bridge player or wish to practise with an optimised hand. Once the bidding sequence is concluded, the screen will display both Norths and Souths hand, the bidding sequence and the final contract. At

that point you can elect to repeat the bidding with the same board number, review the bidding sequence, play the contract, re-start taking you back to the first screen whereby you can set up different parameters for a game - or go to the next deal.

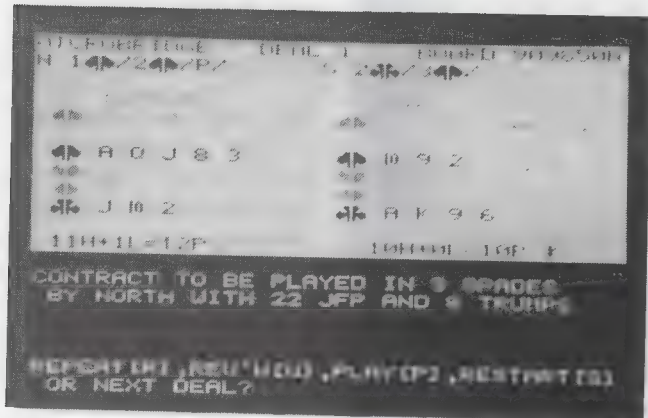
The presentation of the playing screen has been designed so that the atmosphere of a real-life game has been maintained. If the first card of a trick originates from declarer or from the opponent to the left, the opening card will be positioned to the right of the "table" centre.

Where the first card of a trick originates from dummy or declarer's right-hand opponent, the card sequence will be positioned from the left of "table" centre. This feature emphasises visually both the clockwise play of the cards and indicates who has the next play.

MicroBridge is provided with a variety of ways to select cards and cards may be specified in several ways under different conditions:

- ★ Typing in S, H, D or C, to specify the suit, and the card value.
- ★ Where there is only one card in the hand or one card in the suit, any keypress will play it.
- ★ Where it is impossible to follow, and there is only one card in the suit indicated, no further keypresses to identify the card are necessary.
- ★ When following suit, where the suit has already been identified or where all the cards in the hand are of one suit, pressing either the UP or DOWN arrows will play the highest or lowest card respectively.

A bridge goes far



The player has a variety of choices after a deal.

★ A further ramification of selecting a card with the arrow keys, when a suit is being played for the fourth card, the UP arrow key will play the highest card necessary to win the trick. If there is no other card capable of winning the trick, the lowest card in the suit is the one which is played.

★ If you are following suit and are contributing either the second or third card to the trick, the UP arrow will either:

Play the highest card, even if you are holding a lower card which is higher than the card played so far in the trick.

Play the lowest card, if the part-trick has already been ruffed or if a higher card than the highest available to the player has already been played.

I found the MicroBridge format governing keypresses for entering cards into play somewhat daunting at first but, with a little hands-on experience, the system worked well, was easy to get to grips with and improved the speed of play.

At the end of play all four hands are displayed. You then have the option either of playing the hand again so that you may try another approach, to re-start the same hand beginning at the bidding sequence or go to the next deal.

New game

You can press $\bar{E}S\bar{C}$ at any time during play or at the completion of a game and return to successive previous stages of the program. By pressing $\langle ESC \rangle$ three times you will return the first screen from which you may be entering new game parameters.

My first impression of the presentation of MicroBridge is one of professional polish both

in terms of program presentation and in the general feel of the product. There is a complete absence of the carnival atmosphere or other gimmicks often used with such programs to keep the player interested.

Not being a particularly strong Bridge player I found both the lessons and the practice sessions illuminating and both modes have provided excellent indications regarding where my play was weakest.

During the bidding the QL continually updates the indication of the strength and shape of the hand, with an option, at certain points of the bidding, to interrogate the reasoning for making particular bids. In this way, the bidder is able to develop a picture

No cheating

of the hidden hands during the auction in the same way as in a real play.

Overall, I would rate MicroBridge with a 10 out of 10. From a point of view of sheer size, it could justifiably be called monumental. Even more important is the fact that it is an extremely useful tool for getting to grips with the complex subject of Contract Bridge.

One of the most important aspects is that it does not cheat. MicroBridge will play the "unseen" hands "dealt" to it only within the framework of a given game. It is ideally-suited for both the lone player, where the QL is allowed to play the parts of both partner and opponent and, by having a live partner playing the same hand on another QL, a real-life playing environment.

Taskmaster users may be interested to note

that, with the exception of the initial input screen, where the options for setting-up the lessons or play are requested, MicroBridge can be used within a multi-tasking environment. Start-up screen prompts, in common with mode-switching effects seem in the majority of multi-tasking controller programs, may or may not set the flash bits on the active parts of the screen.

Multi tasking

Once the options of the game have been set up, however, the display behaves itself alongside any of the programs I ran with it — mostly with Quill, with which this report was prepared. Although MicroBridge is not intended to be used in such an environment, I often find being able to switch between a report and the product I am reviewing a useful feature.

Although a little knowledge of the basic tenets at Bridge is assumed by the program, beginners can learn sufficient, of the rudiments of Bridge from any number of very good books available on the subject.

Potential new Bridge players may consider looking at two particularly good books on the subject — Alfred Sheinwold's *First Book of Bridge*, published in paperback by Faber. It will take you from the basic elements of Bridge to actual play. The second, Jeremy Flint and Freddie North's *Bridge: The First Principles*, is published by Pan. The book provides numerous examples of the reasoning used to complete a bidding sequence and playing a particular hand.

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The QJUMP Pointer Interface is the core of our development plans for the QL. This is the new standard in multi-windowing multi-tasking environments. It gives you mouse, cursor key or single keystroke control of your QL. Only QJUMP brings you a completely new environment for your expanded QL, providing non-destructive windows for any well written program (and most badly written ones too!) no menus to set up, no silly limitations, just CTRL C to switch between programs. This is the way forward for QL users, while most software will work with it, the best of the new software coming will not work without it. The QJUMP Pointer Interface makes your QL really work!!

QJUMP Pointer Interface Products

GRAM is the RAM based utilities package designed to get the best out of any QL with at least 256 kbytes of additional RAM. GRAM is the starting point for any Pointer Interface system. The GRAM menus pop up at the touch of a key to provide instant access control of your QL.

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QIMI is the Internal Mouse Interface from QJUMP. The QJUMP Pointer Interface automatically detects the Internal Mouse Interface so no changes are needed for any programs which use the QJUMP Pointer Interface. QIMI is the only mouse interface which leaves all of the QL's expansion facilities free for other peripherals. QIMI fits right inside the QL and is supplied with tools. QIMI is ATARI mouse compatible.

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| | | +RTC |
|----------------------|------------------------|------------------------|
| QIMI | £29.90 (£26.00 export) | £39.90 (£34.70 export) |
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| GRAM+QIMI | £54.90 (£47.75 export) | £64.90 (£56.50 export) |
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Watch this space for more QJUMP Pointer Interface products from QJUMP.

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QMON II Monitor/Debugger with single line assembler/disassembler, normal as well as conditional breakpoints, trace and backtrace, search, macro commands, transient windows and full window memory editor and much much more. "Das absolute Spitzenprodukt" (68000er), can we say more?

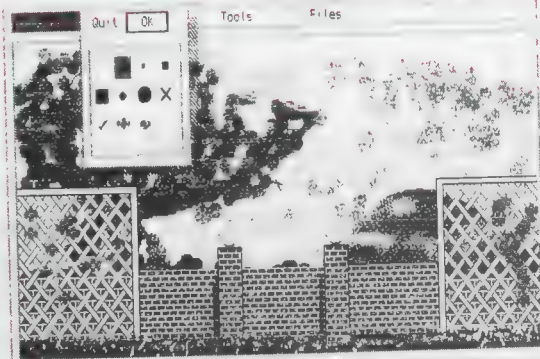
QMON II £19.95 (£17.35 export) Available on Mdv/3.5/5.25

QEP III is the "Rolls Royce" (Sinclair User) of EPROM programmers. Many QLs have been bought just to use QEP III. Programs EPROMs 2716 to 27512, NMOS or CMOS. Features high and low voltage verification. Too many facilities to describe here, it puts £1000 EPROM programmers to shame.

QEP III £129.95 (£113.00 export)

QJUMP can supply floppy disk drivers for those who have been left with unsupported floppy disk systems. Available for Medic (gets round many of the faults on some of the early Medic disk drives) and MicroPeripherals, version 3 or version 5 (provides compatibility with the rest of the QL world and improves performance).

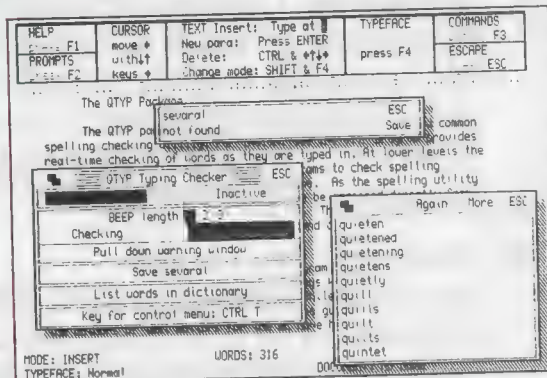
QPLP £14.95 (£13.00 export) for Medic, MP ver3 and ver5



The PAINT demonstration program FREE with QPTR



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text⁸⁷

The Advanced Wordprocessor
for the Sinclair QL

text⁸⁷

Alpha Block Context Doc File Goto Layout Mode Print Ruler Search Type Zap (esc)

Text: 10/11/87

Words: 616

Lines: 8

Frames: 1

- **text87** is a powerful WYSIWYG general-purpose wordprocessor for the Sinclair QL. **text87** provides all common editing commands plus block operations, search and replace, file insert, block save and many other commands through quick menus. Autoword-count, Auto-reformat and Freeze options are available
- **text87** uses special video display founts with variable character size up to the size of text window. Many founts can be loaded and mixed on the same line. Characters can be displayed in each of the three colours. Six founts in different sizes are provided with the program. New founts can be designed with **founted87**
- Many rulers can be predefined and inserted freely anywhere in the document. Left, right, centre and decimal tabs are available. Daisywheel and dot-matrix printers are supported. Micro-spacing, micro-justification, proportional spacing, micro-line-spacing can all be used on most printers. Multiple line headers and footers with variable format plus up to 4 columns can be printed on a page
- **text87** operations are extremely fast even with very large texts (eg searches whole 100K text in 2 seconds). Screen display is more than twice as fast as the QL's own routines. The program is very compact and can be used on an unexpanded QL with its default proportional fount. Any amount of memory expansion can be filled. Texts of up to about 480,000 characters can be edited on a 640k QL
- **text87** is a well-behaved executable multi-tasking program with resizable text window. **text87** is compatible with Spellbound and can import Quill Doc files retaining all the tabs and highlights
- **founted87** is a display fount editor available at extra cost

Prices inclusive of airmail worldwide: text87 £45; founted87 £10

**SOFTWARE 87, 33 SAVERNAKE ROAD
LONDON NW3 2JU**

Secrets of the inner World



L Bryan Davies takes the top off the QL and looks at microdrive maintenance and power supply modifications.

Letters to *QL World* frequently refer, often unwittingly, to the two QL problems which seem to plague users the most — cartridges which cannot be read properly and lock-ups. Here are a few suggestions on dealing with these, as there seem to be many readers who have not heard this previously.

Your mother may have told you not to fiddle with something which is still working. If you are ham-fisted that may be good advice but I find that any QL I see benefits from attention to the drives, even if they are nominally new. A recent letter from a supplier supported this view. The plaintive cry was that "the level of cartridge returns is getting crazy as people's QLs get older." Signs which suggest drives are in need of attention are:

Failure of a newly-purchased commercial program to boot-up, back-up or run. If a replacement cartridge also fails, the odds are definitely that the problem is yours, not the supplier's.

Failure of several cartridges to format; check that there is a write-protect tab in place along the right side, as formatting is not possible without it. Stick Sellotape across the gap if the tab is missing.

A low sector-count when formatting.

One drive giving noticeably fewer sectors than another when cartridges are formatted.

Long times being taken to produce directories or run boot routines.

Before doing any work on the QL, switch off the power; you may not get a shock but you can damage expensive components by poking around with the power still on. The one job which can be done easily, without opening the case, is cleaning the read-write heads to remove tape particles and general dirt from them. If you make frequent use of the drives, this job may need doing every week. Use a Q-tip or cotton bud dipped in a non-violent cleaning liquid such as isopropyl alcohol to wipe the visible surface of the heads gently; they are the clearly-visible silver pieces seen when you look straight into the Microdrive slots.

Make sure not to leave small pieces of cotton behind inside the drive enclosure, as they may get into cartridges and cause jamming eventually. Allow the cleaning liquid to dry before inserting cartridges. Note that leaving cartridges in hot or sunny places for long periods may be harmful to the mechanism and to the tape. Leaving them close to a strong

magnetic field may result in corrupted files.

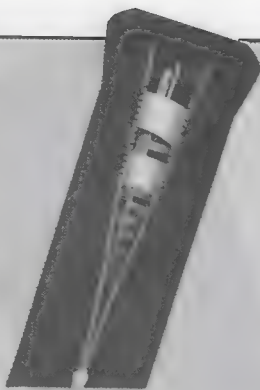
Never touch the tape and keep the protective cover on whenever cartridges are not in the QL. Jamming or apparent tightening of the tape inside the cartridge can sometimes be cleared by tapping the cartridge on a table but one jam is likely to be followed by others in time.

Short screws

All other work necessitates removing the QL top casing. Remove the four short screws from under the top edge at the front and the four long screws from underneath the rear — in line with the feet. Do not be afraid to do this but take care not to disturb the works. In particular, do not poke the components on the circuit board — some of them might malfunction if you give them a charge of static electricity — and do not disturb the two ribbon connectors from the keyboard.

If you find some keys are not working after the case has been put back together again, you will have to open it once more and push the ribbon connectors carefully down into their sockets. The top section of the case should be stood upright, just behind the bottom section, to avoid straining the two connectors; put something





solid behind the top to stop it falling over backwards. If there is much dirt inside, use a fine brush and plenty of blowing to clear it. As a precaution, check that the four screws on top of the Microdrives are secure and also that the single ones are directly underneath.

In cases where a drive does not work except that the motor runs, check the alignment of the read/write head; at least three of the four feet on the head should be touching the mounting base. There is no adjustment for the head so do not try to move it. If doing all the jobs listed does not effect a cure for a dead Microdrive, you have to face the possibility of replacing the complete mdv unit at a cost typically of £20-£30.

The two leaf springs at the bottom and either side of the head should be high enough for the top of them to be about level with the bottom of the guides through which the tape runs; the springs can be raised slightly if necessary but be careful with them. The drive motor is supposedly adjustable in position but I cannot see any way you can alter the position significantly, so leave it alone.

The motor is replaceable on its own by removing the two securing screws and unsoldering two wires but the price of a motor may be almost the same as that of the complete drive unit. The leaf spring to the right of the head, alongside the microswitch, should press strongly enough on the cartridge to hold it against the motor drive roller.

Drive roller

Switch on the QL and insert a cartridge in the drive, then Directory or Format it to get the motor running; press the cartridge towards the spring and check that the latter pushes it back again and the drive roller continues to move the tape without any slipping or jittering. Keep the cartridge flat on the mdv base when inserting it, as it is not difficult to get it out of line when the case is open.

Remove the drive roller from the

motor shaft by pulling it upwards; note which way up the roller is. Examine the surface which touches the tape; if it is uneven or sticky, or if the roller is not tight on the shaft, replace the roller. Clean the running surface of the roller with the same fluid used to clean the heads but be sparing with it as the roller is soft and might be attacked by the fluid. Turn the roller upside down and re-fit it to the shaft; push it down as far as it will go. Strictly speaking, you should check for a clearance of 0.25-0.5mm. between the bottom edge of the roller and the top of the plastic collar beneath it but you may not have a feeler gauge to do this, and pushing it right down is not likely to make the clearance too little.

Too much clearance is one reason for poor performance; lifting the roller should show just a small amount of free play. The microswitch screw should be checked for tightness. The spring which operates the switch button presses against the side of the cartridge, where the write-protect tab fits; if the tab is in place, the switch is actuated when the cartridge is inserted but, if the tab is missing, the spring fits into the slot in the cartridge and does not actuate the switch. When using Sellotape in place of the tab, it has to be tight across the gap or it will not be strong enough to push in the spring — format failed.

Those who feel adventurous can try swapping the drives if one is not working, to see whether the problem is in the drive or not. Remove the single screw holding the 5V regulator to the big heatsink behind the drives, then take off the sink. Remove the screw from underneath the bottom casing and the two round-head screws from the top of the drive base to release each drive; keep the screws apart from the case ones, as they are of different length — note that they are also different lengths from each other.

The ribbon connectors should pull out from the main circuit board but, if they do not seem inclined to come out, I suggest abandoning this particular check rather than risk breaking connections. Different types of connector have been used for the drives and the earlier type is not easily removed.

The wires on the ribbon connector just push directly into the connector on earlier PCBs and re-inserting them all at the same time is not easy — the wire ends are easily bent and weakened. Later drives had an interlocking notch in the right, front side of the drive base, with a corresponding cutout on the left side; replacement drive units may require a notch cutting

off, or a cutout making, before they can be fitted.

There is definitely a difference between some later versions and early ones in the number of sectors given on cartridges. Having damaged a head on a late-model drive, I fitted an early base and head assembly — no notches — and found that I was still getting about 10 sectors more per cartridge than on early drive units, suggesting that the difference does not lie in head assembly. You may manage to obtain just the head/base assembly, which should be much cheaper than buying the whole drive unit, and fitting it is not too difficult. You have to work slowly at the solder joints where the head is attached to the drive circuit board and remove all the solder to enable the base to be removed when the two screws and fibre washers holding the PCB to it are taken out. That will require levering the head steadily from the board, with the soldering iron applied to the joints if you do not have proper de-soldering equipment.

Argument

There is room for argument about how many sectors should be shown when a cartridge is formatted. Sensible people may give you exactly opposite opinions on what is good or bad. My feeling is that a consistently high sector-count is a good sign, not a bad one. Checking dozens of cartridges on a variety of drives has shown me that attending to the drives as described usually results in five to 10 more sectors being available for use on almost all cartridges.

Virtually none of the cartridges I have bought with files already recorded on them has shown a count as much as 220 sectors but equally virtually none has shown less than that after formatting in a drive which has been attended to — 220 is about the value for which to aim. As there are two values given when you ask for a Directory, some explanation is desirable.

The right-hand value xxx/220 is the number of sectors the drive found on the cartridge at the time it was formatted. Some of those sectors may not be in sufficiently good condition to be fit for recording — you will rarely see a count like 220/220 — and the left-hand value tells you how many are available for use. A good average figure is 218/220 for drives and cartridges in good order. Two sectors out of the total on the cartridge are not usable. You should be able to record files on the cartridge until the count

fails to 0/220, although you may have difficulty putting on the last file. Each sector will hold 512 bytes of information/data — half a kilobyte — and 218 sectors is 109K of space, although some space on a cartridge is taken by information about the files on it and there cannot be 109K of user data.

Deterioration of the tape or the mechanical state of the cartridge will be shown by the left value dropping, with the right one possibly staying more or less unchanged. Checking a bunch of recently-formatted cartridges, I found that all except one had differences between left and right values of only 0-3. The cartridges varied considerably in age and usage and three might be taken as a reasonable guide for a cartridge in good condition but you can still use them when the difference increases to five to 10.

Do not trust important files to cartridges showing a difference of much more than five. Do not worry too much if your figures after doing the work listed here are somewhat lower — early drives do not give the number of sectors which some late ones do but I have checked drives from hardware level D04 up to D15 — this figure is stamped on the underside of the case, the higher the number, the later the date of manufacture — and found the 220 sectors figure to be attainable from them all. The thing to look for is an improvement after you have done the work and consistency between cartridges and drives.

Some QLs were manufactured late in the Sinclair Research story and give significantly more sectors on cartridges. I have a JS QL made by Samsung in Korea which consistently produces counts of 230-240. The hardware level on this is SG18, which may equate to D18 in Sinclair terms; the latest number I have heard for U.K. production is D17. As cartridges formatted on this machine appear to give no problems on earlier machines, I now format all cartridges on it to get more sectors; the available space can jump 10-20 sectors on the pre-recorded Psion cartridges which are commonly on sale at present.

When work on the drives is completed, run them with the case open and check that Format and Directory work properly before the case is screwed together. One prime reason for mdv2 failing, rather than mdv1 is the lack of bracing between the two sections of casing, particularly at the right end. Look at the front edge of the QL; the chances are you will see a

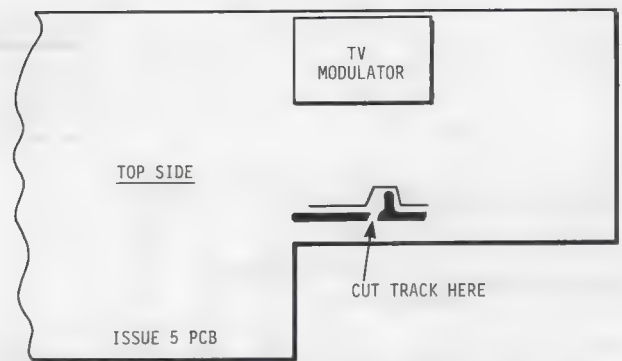


Figure one: track cuts on the top side of an Issue 5 PCB.

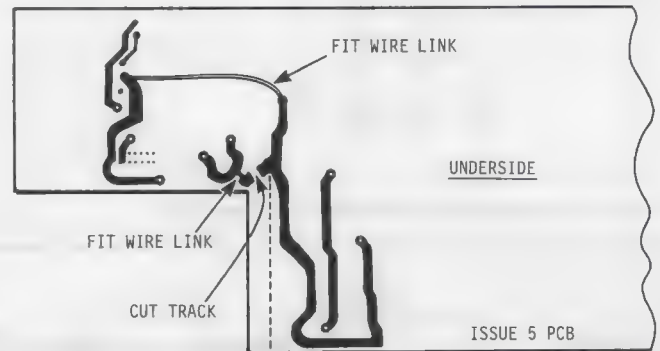


Figure two: track cuts on the underside of the same PCB.

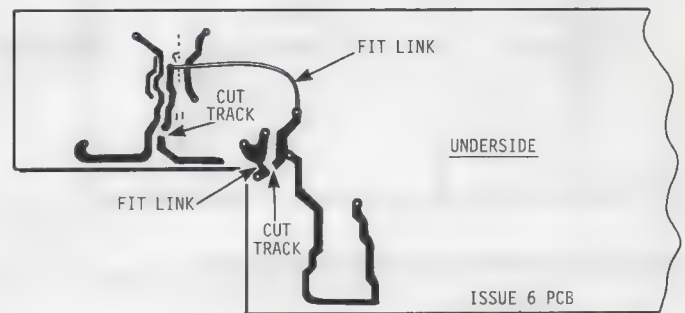


Figure three: track cuts on the underside of an Issue 6 PCB.

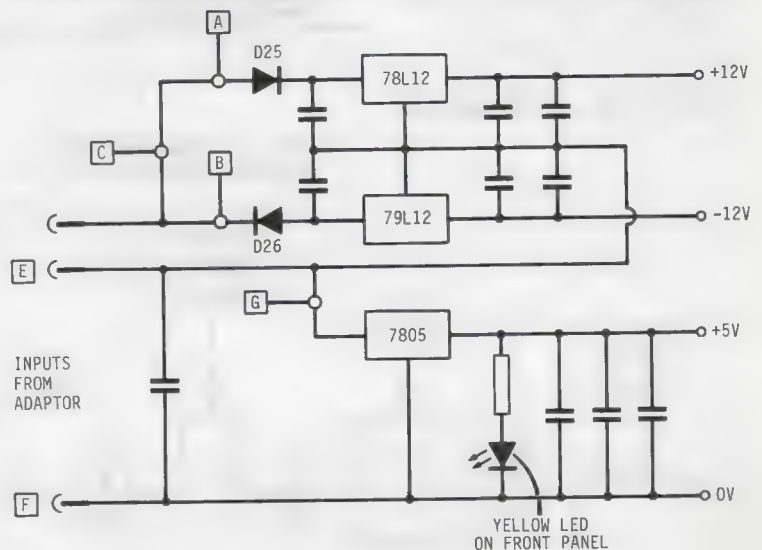


Figure four: track cut, retaining the 7805 regulator.

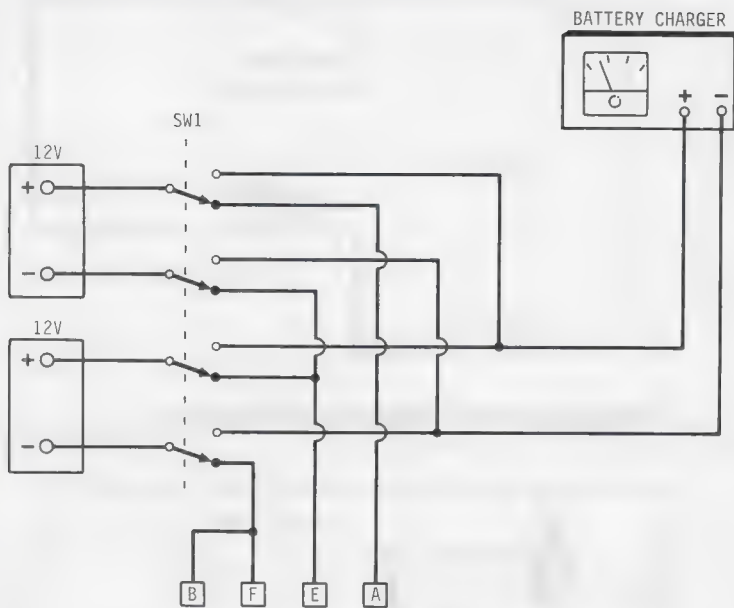


Figure five: connections for a conversion to battery power.

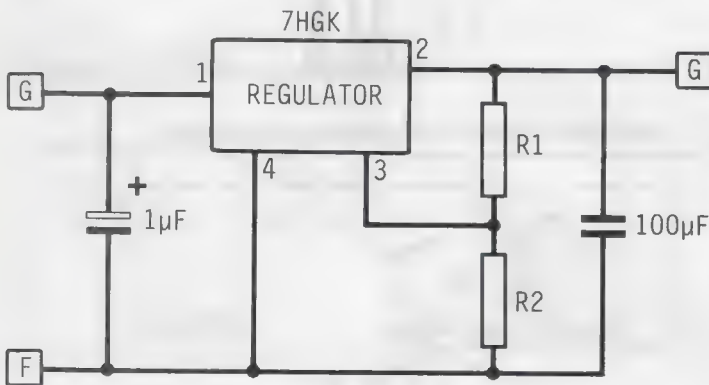


Figure six: link connection, retaining the 7805 regulator.

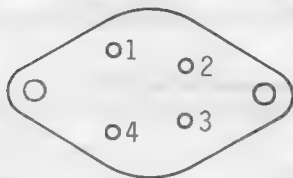
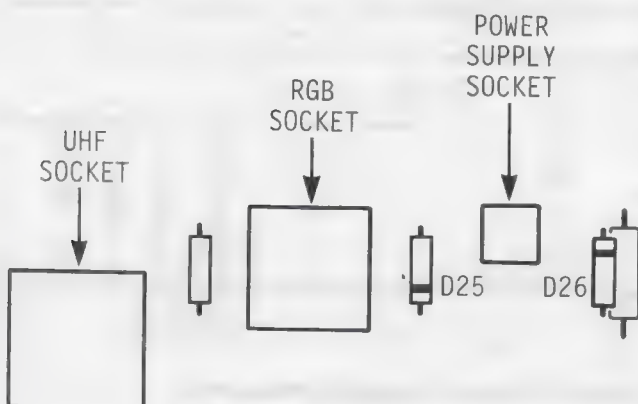


Figure seven: the 78HG(K) seen from the underneath.

UNDERSIDE OF REGULATOR

Figure eight: possible track cut locations for battery conversion.



distinct bow shape, with the middle sagging and the ends stuck up. That does not matter much to mdv1 but it can cause the mdv2 aperture to be at an angle to the drive unit at the right end.

You may find that cartridges which do not run properly when the casing is on work normally when it is taken off. If that is the case, the official modification is to fit a plastic spacer under the screw at the end of the side spring, on mdv2, to prevent the top casing bearing down on the top of cartridges. As the spacer is not generally obtainable, stick a small washer to the upper edge of the bottom casing at the location of the right-most securing hole along the front edge; it also will raise the top casing a little above the cartridge. This is not guaranteed to solve problems with mdv2; it is desirable to look into the mdv2 aperture first and see if anything appears out of line between the aperture and the drive unit.

It is possible that inserting a washer could make matters worse but I have found it to do some good. As a general check of both drives and QL, use the Sinclair System Test 2 program. This checks keyboard, screen, sound and port functions, as well as checking both drives.

There is an electrical modification which can be carried-out to improve Microdrive performance. I cannot say what it is aimed at achieving but it is fairly straightforward to do and should be done by anyone claiming to be capable of using a small soldering iron. Many QLs have been modified in some way and it pays to check what has been done before pulling out the main PCB. This particular modification can be spotted without the PCB being disturbed if the later is issue 5 but issue 6 boards have to be removed to spot the change.

Underside

You have to remove mdv1 to look for the modification. Unfortunately, the issue number is marked on the underside of the board but you can distinguish between them by the presence or absence of two components near the middle of the PCB. The issue 5 PCB has a variable capacitor — TC1 — which is a round can about 1 cm. across with a screw sticking up from the middle; it is next to the left-hand connector for the keyboard ribbon cable and between that and a 14-pin IC socket — for IC17. The issue 6 PCB has neither TC1 nor IC17. The modifications are shown in figures one, two and three; one and two are for issue 5 PCBs, eight is for issue 6.

Use thin insulated wire for the bridges. Some Issue 5 boards have been modified, presumably by Sinclair, in a way not mentioned in the service manual; when there is already a wire link, possibly accompanied by a few components in the area shown in figure two, do not make the modifications shown in figures one and two. If your QL is marked D16 or later underneath, the modification should have been incorporated at the factory during production.

There are three clearly-visible 5V regulators in the QL — one behind each Microdrive assembly — and one in the middle of the large heatsink — the finned piece of metal behind the drives. It is the latter one which is likely to give you trouble. The external power supply produces about 9V DC and the chips require only 5V, leaving the regulator to dispose of 4V, which it does in the form of heat. As the heatsink is situated just under the top casing, with only a few air slots at the front and rear to provide ventilation, it is not surprising that it becomes very hot.

Apart from deterioration in performance of the regulator, the effect of excess heat can be to cause Microdrive problems; the cartridges are only a few centimetres away from the heatsink and, if they are running a good deal during a heavy Quill session, the tape can become too hot for its comfort. This was almost certainly one of the main sources of trouble when the early Psion versions were in use, as they required much more activity of the drives than the later versions do.

The 7805 regulator fitted originally has a current supply rating — 1 amp — which is sufficient for the QL but it appears to become inadequate when an interface is fitted; this is a point which can be argued as some interfaces may not cause trouble but lock-ups are a sign that there is trouble with the 5V supply and you may not have a lock-up until you fit an interface.

Interfaces do not use the 5V from this regulator directly but they use the same 9V from the power supply and effectively increase the load on this to an unacceptable level. A 7805 can vary a good deal in current rating and the designations are confusing, so make sure any replacement is the highest-rated type you can get in the TO220 configuration. The type used for the drives may be only 0.5 amp whereas one and half to two amps is needed on the heatsink.

As a belt-and-braces approach to

inconsistent QL performance, try doing some or all of the following: Replace the 5V regulator on the heat sink or if you have another 7805 use a longer screw and fit it directly above the existing 7805, pushing its leads into the same connector. Fit a spacer between the securing holes of the two regulators to keep them parallel and pressing against each other. Or fit a 78S05, which is the same size but is rated at 2 amps, or an LM340T5/7805, which also is the same size but is rated at 1½ amps.

Apply heat-conductive compound to the mating faces of regulator(s) and heatsink.

Drill some holes in the top casing directly above the heat sink. This can be very effective in reducing the operating temperature of the regulator and must contribute to keeping the chip bias voltage at the correct level — the 5V should not vary by more than $\pm 0.25V$. A grid of about 7 by 17 holes, 3 or 4mm. in diameter, centred over the heatsink, is sufficient. The case has to be opened if only to remove the material drilled out; it is more convenient if the top casing is removed altogether but, if this is done, be very careful removing and refitting the keyboard ribbon connectors.

Small slice

Do not bend the ends by pressing too hard when inserting them. If some keys will not work afterwards, even when the ribbons have been pushed down into the connectors, it is possible to cut a small slice from the end of a ribbon to give better contact but there is a limit to how much can be taken off and still allow the case to be opened easily.

Note where the LED wires fit in their connector before removing them; from the rear of the QL to the front, the order of the wires should be from power LED — red, black; from mdv1 LED, white, black; from mdv2 LED, grey, black. The blacks are all 0V. To get the wires out of the connector, pull the black connector casing upwards to release the ends of the wires. To re-fit the wires, insert them into their sockets, hold them there, press down the black casing until it touches the PCB.

Some users have tackled the heat problem by removing the heatsink and regulator from the QL, putting them on three extension leads. This will certainly improve the heat dissipation but may make it rather inconvenient to move the QL around. If you are satisfied to have the heatsink outside the QL it is probably worthwhile using a

larger one and fitting a higher-capacity regulator and heatsink such as the 78H05 — in a T03 can.

Fit two 0.01 microfarad capacitors between the middle and each side terminal of the 5V regulator. This is worth doing regardless of which type of 7805 is used. The capacitors can be soldered direct to the leads.

Refer to figures four, six and seven. Another way, courtesy of A. Mifsud of Malta, of relieving the strain on the 5V regulator is either to replace it by or put it in-series with a higher power regulator. The 78HGK/78HG regulator is suggested, being a 5 amp type and having a variable 5-20/24V output. If the 7805 is retained, cut the PCB track at "G" — figure four — and connect the output of the 78HG — "G" in figure six — direct to the 7805; otherwise connect the output direct to the 5V line on the output side of the 7805.

The output of the 78HG is set by resistors R1 and R2; for varying the output a 10 kilohm potentiometer can be used instead. Obviously, R1/R2 have to be set to give the voltage on which you decide but the 7805 needs about 7V input to work properly and a safe figure is about 8V; this is 1V lower than the Sinclair power supply gives, and the resulting temperature on the QL casing will be about 4 degrees C lower.

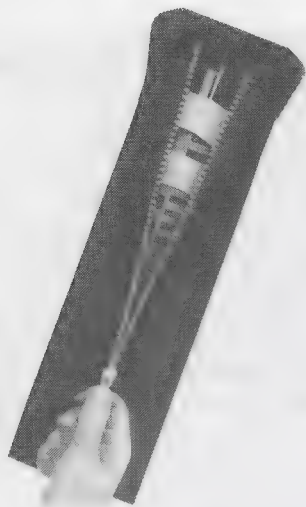
The underside of the 78HG(K) is shown in figure seven. Note that this method removes the need for the 9V input to the QL from the external power supply but does not eliminate the need for the 15V AC — you have to keep the power supply connected. I have not tried this circuit but it looks sensible to me and it works for Mifsud. Do not forget to fit a heatsink to the 78HG(K).

More extreme but useful in some cases is a conversion to 12V supply. This makes the QL immune to mains-borne interference and failures of the mains power. This suggestion, again by Mifsud, may well appeal to users in countries which are hot and have unreliable mains supplies.

There is also the possibility of reasonable portability, at least when you have a car to carry the batteries. The arrangement of two batteries is shown in figure five. The batteries do not have to supply much current and can be ones discarded from motor-cycles. The switch enables the batteries to be connected in parallel to a 12V charger or to the QL.

To connect to the QL, cut the PCB tracks or unsolder the diodes at "A" and "B" — figure one — and connect





from "A" and "B" — figure two — to these points. Alternatively cut at "C" and make the same connections — all three existing input connections on the power socket can then be used.

This removes the need for the 15V AC from the external power supply. Connect the "E" points — originally the AC input. Connect "F" and "B", as the original ground reference for the 7805 regulator now has to be the low end point of the batteries. Again, I have not tried this circuit but it makes sense to me and Mifsud uses it successfully. Figure eight shows where to look for places to cut the tracks on the PCB.

If interfering with the QL PCB does not appeal to you, you can put a 12V regulator in the two lines which, supply 9V from the external power supply normally — dispense with the power supply, get a 12V battery, and make yourself a regulator circuit with sufficient capacity to take the full 12V from the battery and reduce this to a value suitable for input to the QL, say 8V.

This will necessitate either chopping the connector from the power supply lead or finding another one the same — they are not a common type. The circuit is as shown for the 78HGK in figure six and the output is fed to "E" and "F" in figure four. You lose the 15V AC supply doing this and that means the serial ports will not have a 12V DC reference supply, but this is not usually needed for connecting a printer.

Car dashboard

One suggestion, courtesy of Dennis Briggs of Adman Services, is to use a regulator from a car dashboard; instruments typically are fed by a regulator giving 6-10V but you would have to make sure that the output was high enough to guarantee 5V from the 7805 in the QL.

It should be possible to reduce the power supply 9V output to 7-8V at the

power supply, rather than in the QL. The power supply becomes hot also, especially when an interface is fitted to the QL; I measured the temperature on the casing at more than 40 degrees C after fitting an interface and promptly drilled large ventilation holes all over the power supply casing. If you do this, take off the casing first, as there are components directly underneath the top of it. I also mounted it on thick rubber buffers.

These measures reduced the temperature and noise considerably and may have helped keep the supply to the QL more stable. This leads to another possible solution, one which may work without doing any of the foregoing operations. Adman Services now offers a replacement power supply — £15 plus post and packing — which has a lower voltage output for the 5V regulator, with a resultant drop of temperature on the QL casing of about 4 degrees C. This supply also provides AC output needed for generating the 12V DC used by the ports. The operating temperature of the supply seems to be somewhat less than that of the Sinclair supply, probably because the construction and heatsink are better.

Do not disconnect the 15V AC coming from the power supply except when the 12V battery circuit is used as this is needed to generate $\pm 12V$ DC for the serial and expansion ports, although this may not be needed by your printer.

Heating problem

The heating problem may also affect your interface. This probably has a similar 5V regulator inside it and the heatsink used will be fairly small. There should usually be no need to pay attention to this regulator but it is worth thinking about if you have difficulties which seem to relate to the interface rather than the QL. Putting heat-conductive compound on the regulator is worthwhile, even if you are not aware of any problem. Where there is space on the interface PCB, fitting a larger heatsink might be worthwhile. Use of the replacement power supply mentioned brings down temperature on the interface as well as on the QL.

This may be a related problem to the 5V one, insofar as one of the commonest manifestations of interference, lock-ups, seems to become much more prevalent after an interface is fitted. My impression was that overheating associated with the 5V regulator led to lockups on my first QLs, which had no interface fitted.

Originally I tackled this by directing

a fan at the right end of the QL during hot weather; it worked well. After an interface was fitted, the lock-up rate soared and the problem had to be tackled with some urgency, as not much paying work was being done during the brief, lock-up free periods.

Work on the regulator on its own did not prevent lock-ups occurring, although the frequency was reduced.

Any flashes across the screen should be investigated. Whatever caused the flash needs suppressing. It will not necessarily be a high-current device, either; switching off my #2 QL produces flashes on the screen of the #1 system nearby, in spite of all my efforts to suppress everything. On occasion, the good system re-sets when the other one is switched off.

The Sinclair QL service manual and the System Test 2 program can be obtained from various QL suppliers. Check the advertisement pages for them and for replacement QL components. The book is rather expensive — £20-£25, but is useful to users with some knowledge of electronics.

All the suggestions and opinions here are personal, although some are confirmed by what is said in the Sinclair QL service manual, or by comments made by other users. Not being an electronics expert, I have relied on common sense and information supplied by other people; if you have any observations to make, send them to Trouble Shooter at QL World and further comment can than be made in the column.

Information

QL service manual and service test program, replacement power supply, 5V regulators, Microdrives, most QL spares:

Adman Services, 53 Gilpin Road, Admaston, Telford, Shropshire TF5 0BG. Tel: 0925 55895.

Suppressor plug and adapter:

Tony Firshman Services, 12 Bouverie Place, London W2 1RB. Tel: 01-724 9053.

Microdrives, service manual:

TK Computerware, Stone Street, Stanford, Nr Ashford, Kent TN25 6DF. Tel: 030381 2801.

Varistors, suppressor plug, 5V regulators:

Electromail, PO Box 33, Corby, Northamptonshire NN17 9EL. Tel: 0536 204555.

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DIY TOOLKIT

Each month Simon Goodwin adds new commands to the QL repertoire. This month he edits file header parameters.



Every QL file includes a header which contains details of properties of the file which are not part of the data. It is very useful to be able to read and alter disc and tape file headers but commercial toolkit programs like Turbo Toolkit and SuperToolkit are short of such facilities.

A QL file header consists of 64 bytes of data,

although some parts are often blank. Sinclair reserved space for all kinds of details but an unexpanded QL leaves zero bytes in some places; for instance, a standard QL does not record the dates when files were last used, although most disc systems keep track of that information.

Table one shows the meaning of each of the 64 header bytes.

Table one

| Byte | Meaning |
|-------|---|
| 0-3 | File length (long word: number of bytes of data). |
| 4 | File access level (byte: normally zero). |
| 5 | File type (byte: 0 = Data, 1 = Task, 2 = Link file) |
| 6-9 | Data space (long word — zero unless a task file). |
| 10-13 | Extra information (long word — normally unused). |
| 14-15 | Length of file name (word, 0 to 36). |
| 16-51 | File name (up to 36 bytes of ASCII text). |
| 52-55 | Data file was last changed (long word). |
| 56-59 | Data file was last read (long word, often blank). |
| 60-63 | Date file was last copied (long word). |

The command GetHEAD lets you read a file header. It lets you check the file length and the dates when the file was last read, changed or copied. SetHEAD lets you change the dataspace of a task or the file-type or other reserved information.

The commands have two parameters — a channel number and the address of a buffer — an area of memory where the file header can be stored.

Before you can use the commands you must open the relevant file in the normal way. If you have a toolkit you can check first that the file exists, using a function like DEVICE STATUS or FOPEN.

You can reserve the buffer, an area of 64 otherwise-unused bytes of memory, with the standard function RESPR or any variety of toolkit functions. Beware of using the SuperToolkit ALCHP function, as it discards the memory as soon as you load a different Basic program. Turbo Toolkit ALLOCATION will not de-allocate memory until you tell it to do so, or the task which owns the memory terminates.

Listing one shows how the routines are used. It

Seconds

lets you read the details of any file and alter the data space. Note the way the date is read and printed. The date is in the standard QL format, a count of the number of seconds since 1st January, 1961. Many systems record only the first date — the time the file was last changed.

The four bytes of a date are treated as a signed value by PEEK—L. Half the possible values are reserved for

negative dates, leaving 31 bits for all positive values. That implies that the maximum date is sometime in January 2029 — good enough for most purposes but limiting for pension and insurance programmers.

You can represent later dates with negative numbers, most negative first. Thus you can PEEK and print dates up to DATE\$ (-1), or February 6th, 2097, although it is unwise to compare dates using signed arithmetic.

As is often the case on the QL, it is easier to read information than to change it. For some reason best-known to Qdos designer Tony Tebby, the QL FS.HEADS routine rewrites only the first 15 bytes of a header and the length of a file is re-set when the file is closed, so you cannot re-name a file or set the dates this way.

Dataspace

SetHEAD lets you alter the dataspace of a task easily. The old way to do this was to load the whole file with LBYTES, DELETE it and re-save it with SEXEC. SetHEAD does the job much faster and more economically.

You can also SetHEAD to hide information in the 'access,' 'type' and 'extra' slots. Read the header with GetHEAD, POKE the buffer with new values, and store them with SetHEAD. Do not forget to CLOSE the file when you have finished.

The code for GetHEAD and SetHEAD is listed in two forms. Listing two gives a quick way to enter the code without using an assembler. It loads the equivalent machine code from DATA statements and saves the code in a file. Once you have loaded that file, as follows, you

can use SetHEAD and GetHEAD in your own programs.

```
base = RESPR(144) :
LBYTES "file name,"
base : CALL base
```

The first part of listing two is Marcus Jeffrey's standard loader, used in every month's DIY Toolkit project. Only the DATA, from line 590 onwards, changes from month to month.

Listing three is the assembly code program, assembled using HiSoft Devpac. You can type this text into your assembler if you want to customise the code or merge it with other routines.

The code is straightforward. The START routine calls BP.INIT, the ROM vector which adds new commands to SuperBasic. The table labelled DEFINE indicates that two new procedures are to be added and gives their names and addresses.

ROM vector

The code for each procedure is identical, except that GetHEAD loads the system key for the FS.HEADR routine into D4 whereas SetHEAD loads the key for FS.HEADS. From then it is a matter of checking the parameters and converting them into the form the operating system expects.

First we read the Basic channel number and look up the appropriate system identifier in the SuperBasic table of channel details. If the identifier is negative, or the entry would be outside the limits of the table, we report CHANNEL NOT OPEN. This piece of code can be used whenever you want to pick up a Basic channel number and use it in an extension command.

Long integers

Next we read the remaining parameters as long integers, also known as 32-bit addresses. There should be only one parameter left, the buffer address. We check that it is an even number, as PEEK L and POKE L work only from even locations. Then we copy the parameters into the registers expected by Qdos and call the ROM. If anything goes wrong, Basic will report the error indicated by the value in DO after the TRAP.

● I shall be back next month with more code and commentary. If you would like to explore a specific area in this column, or implement new commands, particularly ones unavailable in commercial toolkits, please send your suggestion to *QL World*.

Listing one: the program for altering data space.

```
100 buffer=RESPR(64)
110 REPEAT loop
120 INPUT "Enter device and file name ";file$
130 OPEN #3,file$
140 GetHEAD #3,buffer
150 PRINT file$;";";PEEK_L(buffer);" bytes."
160 PRINT "Last altered ";DATE$(PEEK_L(buffer+52))
170 PRINT "Current data space ";PEEK_L(buffer+6)
180 INPUT "Enter new data space ";ds
190 POKE_L buffer+6,ds
200 SetHEAD #3,buffer
210 CLOSE #3
220 END REPEAT loop
```

Listing two: standard loader.

```
QL WORLD DIY TOOLKIT February 1988 Listing 2 of 3
100 REMark : Sinclair QL World.
110 REMark : ** HEX LOADER **
120 :
130 CLS
140 RESTORE
150 READ space
160 start = RESPR(space)
170 PRINT "Loading Hex...";hex_load start
180 INPUT "Save to file...";f$
190 SBYTES f$,start,byte
200 STOP
210 :
220 :
230 DEFINE PROCEDURE hex_load(start)
240 :
250 DEFINE FUNCTION decimal(x)
260 RETURN CODE(h$(x))-48-7*(h$(x)>"9")
270 END DEFINE decimal
280 :
290 byte = 0 : checksum = 0
300 REPEAT load_hex_digits
310 READ h$
320 IF h$="*" : EXIT load_hex_digits
330 IF LEN(h$)<>2*INT(LEN(h$)/2) THEN
340 PRINT "Odd number of hex digits in: ";h$
350 STOP
360 END IF
370 FOR b = 1 TO LEN(h$) STEP 2
380 hb = decimal(b) : lb = decimal(b+1)
390 IF hb<0 OR hb>15 OR lb<0 OR lb>15
400 PRINT "Illegal hex digit in: ";h$
410 STOP
420 END IF
430 POKE start+byte,16*hb+lb
440 checksum = checksum + 16*hb + lb
450 byte = byte + 1
460 END FOR b
470 END REPEAT load_hex_digits
480 READ check
490 IF check <> checksum
500 PRINT "Checksum incorrect. Recheck data."
510 STOP
520 ELSE
530 PRINT "Checksum is correct"
540 PRINT "Data entered at: ";start
550 END IF
560 END DEFINE hex_load
570 :
580 REMark : Space requirements for the machine code
590 DATA 144
600 :
610 REMark : Machine code data
620 DATA "43FA000A34790000","01104ED20002001E"
630 DATA "0747657448454144","0010075365744845"
640 DATA "4144000000000000","784660027847BBCB"
650 DATA "675A2A0D4BE0008","3479000001124E92"
660 DATA "664C3031E80054AE","0058264D2A45C0FC"
670 DATA "0028D0AE0030B0AE","00346C2C2A360800"
680 DATA "6B26347900000118","4E9266225343861C"
690 DATA "2031E80008000000","6612204522407440"
700 DATA "766420044E434E75","70FA4E7570F14E75"
840 DATA "*",10007
```

Listing three: assembly code (using HiSoft Devpac).

```
* QL WORLD DIY TOOLKIT - HEADER procedures
* Ver. 0.2, Copyright 1987 Simon N Goodwin.
*
start lea.l define,a1
move.w $110,a2 BP.INIT vector
jmp (a2)
*
define dc.w 2 Two procedures
dc.w gethead**
dc.b 7,"GetHEAD" #channel%,address
ds.w 0
dc.w sethead**
```




DIY TOOLKIT

THE LOST LISTING

```

dc.b 7,'SetHEAD' #channelZ,address
ds.w 0
dc.w 0,0,0 No functions
*
sethead moveq #70,d4 FS.HEADS key
bra.s parse_ch
gethead moveq #71,d4 FS.HEADR key
parse_ch cmp.l a3,a5 Any parameters?
beq.s bad_param
*
* Read the first parameter - the channel number
*
move.l a5,d5 Save end of table
lea.l 8(a3),a5 Isolate parameter
move.w #112,a2 Vector to get integers
jsr (a2)
bne.s bad_exit
move.w 0(a1,a6.1),d0
addq.l #2,$58(a6) Lose stacked integer
move.l a5,a3 Step past parameter
move.l d5,a5
*
* Convert channel number in D0 to channel ID in D5
*
chan_sel mulu #40,d0 Channel table size
add.l $30(a6),d0 Add base offset
cmp.l $34(a6),d0
bge.s what_chan Past end of table?
move.l 0(a6,d0.1),d5
bmi.s what_chan Closed if negative
*
* Read and check the address parameter in D0
*
move.w #118,a2 Vector gets addresses
jsr (a2)
bne.s bad_exit
subq.w #1,d3 Test No. of parameters
bne.s bad_param Reject unless it's one
move.l 0(a1,a6.1),d0
btst #0,d0 Is the parameter odd?
bne.s bad_param
*
* Set standard registers and exit via QDOS
*
move.l d5,a0 Set up channel ID
move.l d0,a1 ... buffer address
moveq #64,d2 ... buffer length
moveq #100,d3 ... allow two seconds
move.l d4,d0 ... set the trap key
trap #3 Call QDOS
rts Return error code
*
what_chan moveq #-6,d0 CHANNEL NOT OPEN error
rts
bad_param moveq #-15,d0 BAD PARAMETER error
bad_exit rts
end

```

```

1 * QL WORLD DIY TOOLKIT - EDLINE$ function, by Simon N Goodwin
2
3 00000000 43FA000A start lea.l define,a1
4 00000004 34790000110 move.w #110,a2 BP_INIT
5 0000000A 4ED2 jmp (a2)
6
7 0000000C 00000000 define dc.w 0,0 No procedures
8 00000010 0001 dc.w 1 One function
9 00000012 000C dc.w edline+
10 00000014 0745444C49484524 dc.b 7,'EDLINE$'
11 0000001C 0000 dc.w 0 End of functions
12
13 0000001E 2A0D edline move.l a5,d5 Save last parameter address
14 00000020 4BE0018 lea.l 3*(a3),a5 Check for three parameters
15 00000024 BA8D cmp.l a5,d5
16 00000026 6654 bne.s bad_param Not 3 unless A3+24 = A5
17
18 * Read the first two parameters: channel number and buffer size
19
20 00000028 518D subq.l #8,a5 Hide the last parameter
21 0000002A 347900000112 move.w #112,a2 CA.GTINT - get two ints
22 00000030 4E92 jsr (a2)
23 00000032 664A bne.s bad_exit
24 00000034 58AE0058 addq.l #4,$58(a6) Tidy 2 ints off maths stack
25 00000038 3E31E802 move.l 2(a1,a6.1),d7 Grab the buffer length
26 0000003C 264D move.l a5,a3 Retrieve the last parameter
27 0000003E 2A45 move.l d5,a5
28 00000040 3E31E802 move.w 2(a1,a6.1),d7
29
30 * Convert stacked channel number to channel ID in D5
31
32 00000044 3031E800 move.w 0(a1,a6.1),d0 Grab the channel number
33 00000048 C0FC0028 mulu.w #40,d0 Find offset in table
34 0000004C D0AE0030 add.l $30(a6),d0 Add base offset
35 00000050 B0AE0034 cmp.l $34(a6),d0 Check not beyond end
36 00000054 6C22 bge.s what_chan
37 00000056 2A360800 move.l 0(a6,d0.1),d5 Get channel ID
38 0000005A 6B1C bml.s what_chan Channel must be open
39
40 * Get the default string and check it fits the buffer
41
42 0000005C 347900000116 move.w #116,a2 CA.GTSTR - get a string
43 00000062 4E92 jsr (a2)
44 00000064 6618 bne.s bad_exit
45 00000066 5247 addq.w #1,d7 Allow for terminator/cursor
46 00000068 202E0008 move.l 8(a6),d0 Get offset of end of buffer
47 0000006C 5180 subq.l #8,d0 Allow for 8 coordinate bytes
48 0000006E 9096 sub.l (a6),d0 D0 is now maximum buffer size
49 00000070 BE40 cmp.w d0,d7 See if the chosen size fits
50 00000072 6516 bcs.s got_room
51
52 00000074 70FB moveq #-5,d0 BUFFER FULL error
53 00000076 4B75 rts
54 00000078 70FA what_chan moveq #-6,d0 CHANNEL NOT OPEN error
55 0000007A 4B75 rts
56 0000007C 70F1 bad_param moveq #-15,d0 BAD PARAMETER error
57 0000007E 4B75 bad_exit rts
58
59 00000080 4E43 call_QDOS trap #3 General-purpose ROM caller
60 00000082 4A80 tst.l d0
61 00000084 6702 beq.s hunky_dory
62 00000086 185F addq.l #4,a7 Return to previous caller
63 00000088 4E75 hunky_dory rts
64
65 * Put the string in the buffer: save first 8 bytes for later
66
67 0000008A 41E90002 got_room lea.l 2(a1),a0 Move FROM (offset)
68 0000008C 2456 move.l (a6),a2 Move TO (offset)
69 0000008E 605A addq.l #8,a2 Save first 8 bytes
70 00000090 3431E800 move.w 0(a1,a6.1),d2
71 00000092 3C02 move.w d2,d6 D6 is a copy of the length
72 00000094 224A move.l a2,a1 A1 will point at the string
73 00000096 BC47 cmp.w d7,d6 Check it'll fit!
74 00000098 64DE bcc.s bad_param Reject if D7>D6
75 0000009A 810000A8 bsr move_str Move D6 bytes to (A8,A2)
76 0000009C 2808 no_move move.l a0,d4 D4 is the empty stack offset
77
78 * Find out where we are on the screen
79
80 000000A4 76FF where moveq #-1,d3 Timeout
81 000000A6 2045 move.l d5,a0 Channel ID
82 000000A8 2A08 move.l a1,d5 Save string pointer
83 000000AA 2256 move.l (a6),a1 Put coords. at start of buffer

```


QL WORLD owes an apology to Simon Goodwin and the DIY Toolkit readers: owing to a mix-up in the moves at the QLW office over the last two months, the listings which should have accompanied DIY Toolkit in the January issue were left on the cutting room floor. The article featured EDLINE\$, a string function for editing and confirming individual lines of text.

The program is listed below; listing one is the assembly code program; listing two is the standard machine code loader, with EDLINE\$ data.

The EDLINE\$ listings are therefore self-contained for anybody who wants to make a copy of these pages to collate with the January edition of DIY Toolkit.

```

84 000000AC 4E44      trap      #4      Buffer is A6 relative
85 000000AE 700B      moveq    #11,d0   SD.CHENQ
86 000000B0 61CE      bsr.s    call_qdos
87
88      *
89      * Go to the initial cursor position and print the text
90
91 000000B2 2256      go_there move.l    (a6),a1    Find coordinate buffer
92 000000B4 3268904   move.w   4(a6,a1.l),d1 Extract cursor X
93 000000B6 4842      swap     d2      Save length
94 000000B8 34368806   move.w   6(a6,a1.l),d2 Extract cursor Y
95 000000BA 61BE      bsr.s    call_qdos SD.POS
96 000000BC 4842      swap     d2      Retrieve the length
97 000000C4 2245      move.l   d5,a1    Restore the start pointer
98 000000C6 4E44      trap     #4      Pointer is A6 relative
99 000000C8 7007      moveq    #7,d0    IO.SSTBC
100 000000CA 61B4      bsr.s    call_qdos
101 000000CC 7220      moveq    #32,d1
102 000000CE 7005      moveq    #5,d0    IO.SBYTE - blank end of line
103 000000D0 61AE      bsr.s    call_qdos
104 000000D2 7013      moveq    #19,d0   SD.PCOL - move cursor to blank
105 000000D4 61AA      bsr.s    call_qdos
106
107      *
108      * Call up the editor
109
110 000000D6 3202      edit     move.w   d2,d1    Put cursor at end of text
111 000000D8 4841      rswap   d1
112 000000DA 3202      move.w   d2,d1    Indicate length of text
113 000000DC 2256      move.l   (a6),a1  Find buffer
114 000000DE 43F11008   lea.l   8(a1,d1.w),a1 Point to last character
115 000000E0 3407      move.w   d7,d2    Maximum length
116 000000E2 4844      trap     #4      Everything is relative!
117 000000E4 7004      moveq    #4,d0    IO.EDLIN
118 000000E6 4843      trap     #3
119 000000E8 4A80      tst.l   d0
120 000000EA 61A1      bpl.s   edited    No error: check terminator
121 000000EC 0C40FFFF   cmpi.w  #-1,d0    Did the user type BREAK?
122 000000EE 6608      bne.s   whats_up
123 000000F0 700F      moveq    #15,d0   SD.CODES for AH & JH BOWs
124 000000F2 6186      bsr.s    call_qdos which leave the cursor on
125 000000F4 707F      moveq    #-1,d0   Error: not complete
126
127 000000FA 4E75      begone   rts
128
129 000000FC 0C40FFFB   whats_up cmpi.w  #5,d0    Buffer overflow?
130 000000FE 66F8      bne.s   begone   Give up if anything else!
131 00000100 5341      subq.w  #1,d1    Discard the last character
132 00000102 3401      re_enter move.w   d1,d2    Slide up to the end-stop
133 00000104 60AA      bra.s   go_there Try again
134
135 00000106 5341      edited   subq.w  #1,d1    Don't count last character
136 00000108 5389      subq.l  #1,a1    Point at it
137 0000010A 0C36000A8800   cmpi.b  #10,0(a6,a1.l)
138 0000010C 66F8      bne.s   restart unless it was ENTER
139
140 00000110 5584      enter   subq.l  #2,d4    Make room to stack length
141 00000112 2D440058   move.l  d4,450(a6) Reset maths stack pointer
142 00000114 3C01      move.w   d1,d6    Keep length for move later
143 00000116 48C1      allocate ext.l   d1
144 00000118 34790000011A   move.w  #11A,a2   BV.CHRIX
145 0000011A 4892      jsr     (a2)      Allocate space for text
146 0000011C 558(a6),a1   move.l  #58(a6),a1 Make room for text
147 0000011E d6,a1      subq.l  #0,d6     Ensure A1 is even before
148 00000120 08060000    beg.s   on_grid  ...stacking the length
149 00000122 6702      subq.l  #1,a1
150 00000124 5389      on_grid move.w  d6,0(a1,a6.l)
151 00000126 2D490058   move.l  a1,450(a6)
152 00000128 2056      movea.l (a6),a0
153 0000012A 5088      addq.l  #8,a0     A0 is offset of text in buffer
154 0000012C 45890002   lea.l  2(a1),a2  A2 is destination offset
155 0000012E 7801      moveq   #1,d4    Return a string
156 00000130 7000      moveq   #0,d0    No error
157
158      *
159      * MOVE_STR: Moves D6 bytes, wordwise, from offset A0 to A2
160
161 00000132 534E      move_str subq.w  #1,d6    Count:::(D6-1) DIV 2
162 00000134 6B10      bml.s   null_move
163 00000136 E24E      lsr.w   #1,d6    ...prepare to DBRA words
164 00000138 3DB68800A800   move_some move.v  0(a6,a0.l),0(a6,a2.l)
165 0000013A 548A      addq.l  #2,a2
166 0000013C 5488      addq.l  #2,a0
167 0000013E 51C8FFFF   dbra   d6,move_some
168 00000140 4E75      null_move rts
169
170      end

```

EDLINE\$ listing one: assembly code.

EDLINE\$ listing two: hex code loader.

```

100 REMARK : Sinclair QL World
110 REMARK : ** HEX LOADER **
120 :
130 CLS
140 RESTORE
150 READ space
160 start = RESPR(space)
170 PRINT"Loading Hex..." : hex_load start
180 INPUT"Save to file..." : filename
190 GET #1, start, byte
200 STOP
210 :
220 :
230 DEFINE PROCEDURE hex_load(start)
240 :
250   DEFINE FUNCTION decimal(x)
260   RETURN CODE(h*(x))-48-7*(h*(x)>"9")
270   END DEFINE decimal
280 :
290 byte = 0 : checksum = 0
300 REPEAT load_hex_digits
310   READ h#
320   IF h#="*" : EXIT load_hex_digits
330   IF LEN(h#)<>2*INT(LEN(h#)/2) THEN
340     PRINT"Odd number of hex digits in: "h#
350     STOP
360   END IF
370   FOR b = 1 TO LEN(h#) STEP 2
380     hb = decimal(h#(b)) : lb = decimal(h#(b+1))
390     IF hb<0 OR hb>15 OR lb<0 OR lb>15
400       PRINT"illegal hex digit in: "h#
410       STOP
420     END IF
430     POKE start+byte,16*hb+lb
440     checksum = checksum + 16*hb + lb
450     byte = byte + 1
460   END FOR h#
470 END REPEAT load_hex_digits
480 READ check
490 IF check <> checksum
500   PRINT"Checksum incorrect. Recheck data."
510   STOP
520 ELSE
530   PRINT"Checksum is correct"
540   PRINT"Data entered at: "start
550 END IF
560 END DEFINE hex_load
570 :
580 REMARK : Space requirements for the machine code
590 DATA 350
600 :
610 REMARK : Machine code data
620 DATA "43FA000A34790000","01104ED200000000"
630 DATA "000100000745444C","494E452400002A0D"
640 DATA "48EB0018B8B6654","51BD34790000112"
650 DATA "4E72664A58A0058","3E31EB02264D2A45"
660 DATA "3E31EB023031EB00","C0FC0028D0AE0030"
670 DATA "80AE00346C222A36","0B00681C34790000"
680 DATA "01164E9266185247","202E000851809096"
690 DATA "BE40651670FB4E75","70FA4E7570F14E75"
700 DATA "4E434A80670258BF","4E7541E900022454"
710 DATA "50BA3431EB003C02","224A8C4764DE6100"
720 DATA "00A8280876FF2045","2A0922564E44700B"
730 DATA "61CE225632369804","48A234369B067010"
740 DATA "61BE484222454E44","700761B472207005"
750 DATA "61AE701361AA3202","48413202225643F1"
760 DATA "100834074E447004","4E434A806A1A0C40"
770 DATA "FFFF6608700F6188","70FF4E750C40FFFB"
780 DATA "66F85341340160AA","534153890C36000A"
790 DATA "9B0066F055B42D44","00583D0148C13479"
800 DATA "0000011A4E92228E","005893C608060000"
810 DATA "670253893386EB00","2D47005820565088"
820 DATA "45E900027B017000","53466810E24E3DE6"
830 DATA "8800A800548A5488","51CEFFFA4E75","*"
840 DATA 28250

```


S E C T O R

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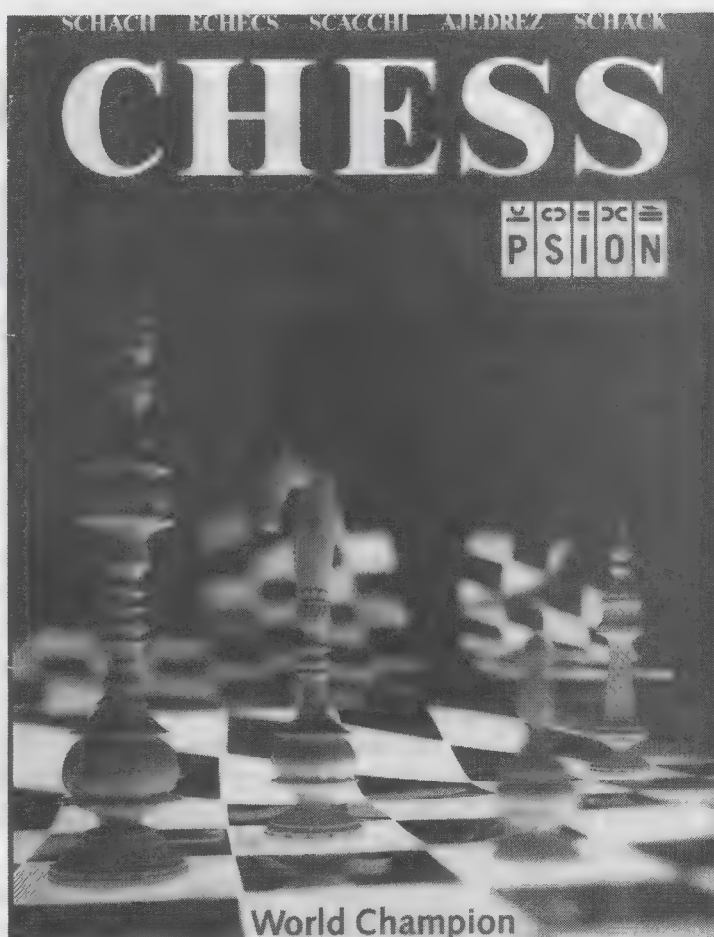

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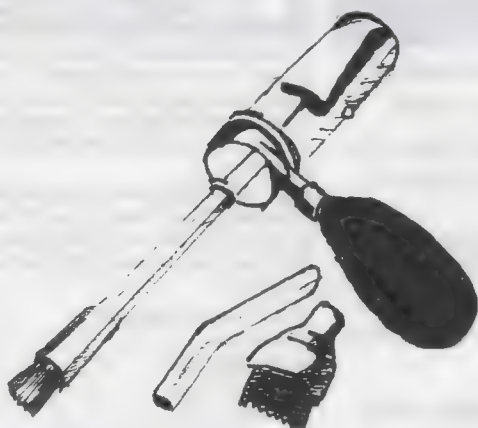
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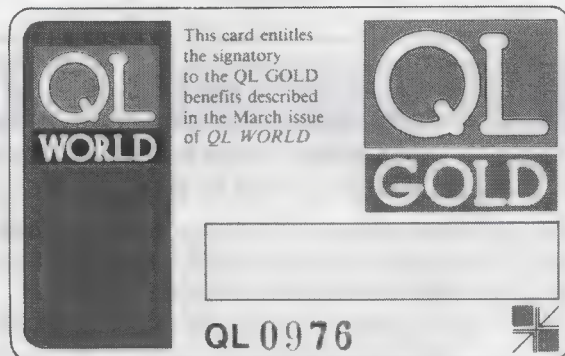
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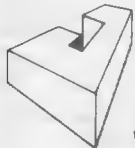


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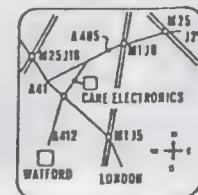
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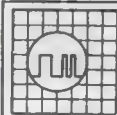
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2. Richard A + O Mini Monitor £3
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4. Shergold & B Golf £2
Tose

With up to 50 courses of varying difficulty, lakes, rivers, bunkers and trees. You decide the power and direction of each stroke, striving for a birdie, eagle or even an albatross. Your scorecard may be saved. *QL User*, May 1985.

5. Williams A + O Paladin £5
& Holliday

Written completely in machine code, this excellent *Space Invaders* game was the basis of our games programming series, started in April 1985.

7. Steve Deary B Pacman £1

Almost 20 screens of increasing difficulty, including an invisible maze, make it a very versatile rendition of the arcade favourite. *QL User*, March 1985.

8. Andy B Family Tree £3
Carmichael

An Archive program and database for setting-up and displaying large family trees. *QL User*, August 1985.

9. James Lucy L Composer £3

Completed in *QL User*, October 1985, this QLiberated program will allow you to compose, play and edit music. The program will handle sharps, vary tempo, and specify staccato and legato playing styles.

13. S J Ackers S Touch Type £4

This program has a 13-lesson course for typing letters, words and phrases, a 700-word vocabulary, an interactive keyboard display and a fingering chart as more than 30K of code. Scores are based on the speed and accuracy of typing. a reduced version was printed in the August 1985 issue.

17. Tony Quinn S CAD QL £4

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19. Karl Jeffrey M + B Starport 2001 £3

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24. J F Tydeman S Design 3D £4

3D screen designs with the minimum of fuss and aggravation. *QL World*, March/April 1987.

25. D Carmona B Stellaris £4

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29. Peter B Bridge £4
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31. B Otridge Crossword £5

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33. Leslie B Clock £3
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34. E Bamber QL Conversion/ £2
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Finally, for all new programs on the Exchange, rather than just receiving the machine code version, the Supercharged version or whatever, we will be able to supply assembly listings, hex loaders and original Super Basic versions on the same cartridge, so that you can look at and amend programs.

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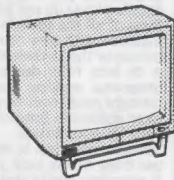
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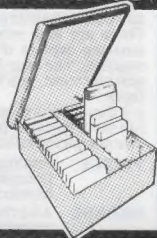
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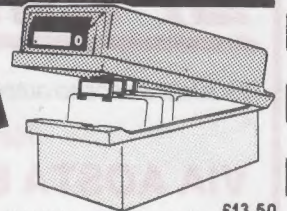
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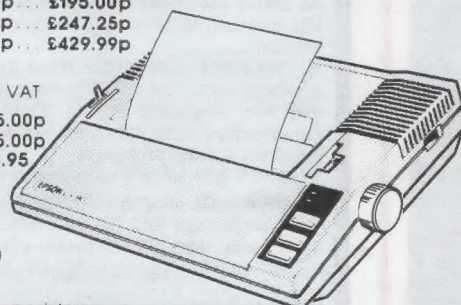
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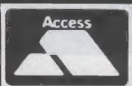
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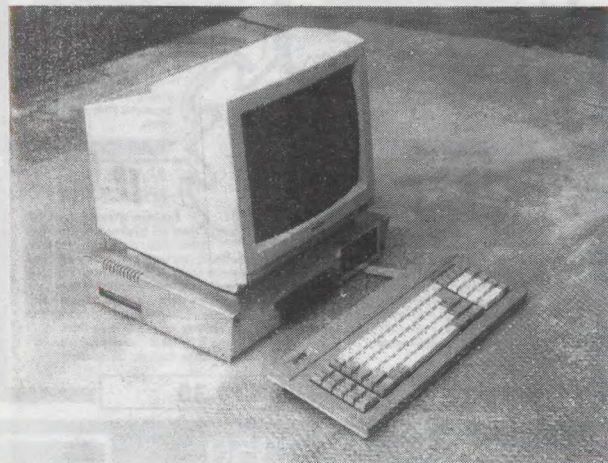
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A 32 Icon fully definable environment is provided to be from within your own programs making them simple to use and even more user friendly than you thought could ever be possible.

User definable function keys are at last brought to your QL, these can help make your QL a joy to use.

The character set is made fully definable and simple routines are provided to allow use from within both your own and other peoples programs.

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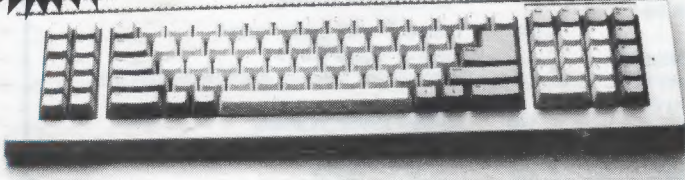


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